Toward A Better Understanding Of Community Mobilization For Maternal Health In Rural Zambia

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Nursing)
in the University of Michigan
2020

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Dedication

This work is dedicated to Esmé Leonie and Paul. To my mother. To my sisters and their families.

Acknowledgements

Thank you to the participants from rural Zambia and the Africare Zambia staff. Thank you to my mentors. Thank you to my peers in the UMSN and RWJF cohort and the RWJF at Johnson and Johnson for funding my PhD. Thank you to my professors and the leadership at the University of Michigan for cultivating a rigorous and rewarding educational experience.

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Abstract

Community mobilization is a process oriented solution for complex societal problems, including interventions addressing maternal health. Community mobilization (CM) is defined as a capacity-building process through which stakeholders engage in participatory and specific activities to improve and sustain their condition. Despite frequent use, measurement of complex outcomes from the process or a description of the domains involved is lacking. Little is known about how individuals are impacted as a result of the CM process or how community members perceive the function of CM.

This mixed methods study evaluated change in individual and community level domains of CM, using longitudinal data from a three year intervention study employing CM prior to introducing a maternity waiting home intervention in rural Zambia. A CM survey was collected from three groups (women, health workers, community members; n=1,202) with associated focus groups (n=76) at two timepoints. Data were collected from ten intervention sites and ten comparison sites. Factor analysis refined factors used to assess change over time using a multivariable model. Focus group data were analyzed using content analysis with the CM domains as a priori themes and an unconstrained categorization matrix to guide our interpretation and allow for latent themes. Data were merged using a convergent mixed methods approach.

Factor analysis maintained the domains of governance, collective efficacy, self-efficacy, and power in relationships. Focus group data indicated social cohesion as key to the CM intervention, with health workers interfacing between the health system, relatives, and pregnant

women. The CM domains of self-efficacy, power in relationships, and governance each showed significant change over time in the multivariable models ($p<0.001$). Interaction effects showed increases in the self-efficacy factor isolated within intervention communities (0.34, $p<0.001$). Women had significantly lower factor scores for self-efficacy, governance, and collective efficacy compared with health workers or community members. Those with less education had lower self-efficacy ($p<0.001$), collective efficacy ($p<0.01$), and governance ($p<0.01$) scores. Content analysis revealed barriers and facilitators to healthcare for pregnant women. Barriers were structural (e.g., poor road infrastructure) and cultural (e.g., traditional gender roles). Facilitators included the CM domains of collective action, governance, social cohesion, and self-efficacy. Merged data indicated domains of CM had varying group dependent impact, influenced by cultural and structural realities.

Our analyses showed CM had a significant impact on various individual and community based CM domains in rural Zambia influenced by structural and cultural context. Future work should employ mixed methods to plan for implementation of CM interventions and contextualize their results. Evaluations of CM benefit from comprehensively investigating domains across various groups, linking impact to health outcomes.

Chapter 1 : Introduction

The following study addresses current gaps in the science of Community Mobilization (CM) measurement and reporting through examination of CM domain data collected as a part of a large, longitudinal Maternity Waiting Homes (MWH) evaluation in two districts in rural Zambia. The parent study evaluating MWH used CM as a part of a package of interventions. These included the evaluation of six CM community level related domains: 1) collective action, 2) collective efficacy, 3) governance, 4) perceived control, 5) social acceptance/cohesion, and 6) social support/networks. In addition, the parent study collected information on the following individual level domains related to psychological empowerment: 1) self-efficacy, 2) power in relationships. This dissertation study evaluated longitudinal, cross-sectional data from the parent study; this secondary analysis examined the impact of CM in 10 rural communities in Zambia with recently constructed MWHs, also known as Zambian Mother's Shelters (ZaMs). This was achieved using a concurrent mixed methods design through the following specific aims:

Aim 1: Examine the change over three years in domains of CM among a sample of rural Zambians from three groups (women with babies, community members, health workers) within 10 communities surrounding the ZaMS using both baseline (n=554) and endline data (n=649).

Sub-Aim1: Examine the factor structure (i.e, latent constructs) of the CM survey tool among rural Zambians using both the baseline and endline data.

Aim2: Identify how constructs of CM influence women's care seeking behaviors during pregnancy and childbirth (n=76 focus groups with 403 participants).

Aim 3. Describe the process that engages and mobilizes communities in rural Zambia toward improved maternal health outcomes using a concurrent mixed methods approach (n=76 focus groups with 1,203 participants; N=1,300 CM survey participants).

The CM survey used in the parent study included items adapted from domains identified as relevant in a systematic review of the measurement of CM processes in interventions targeting sexual and reproductive health (Altman, Kuhlmann, & Galavotti, 2015). To meet Aim 1, multivariate descriptive models and ordinary least squares regression were used. Change in CM domains was evaluated between pre- and post-tests while Sub-Aim 1 employed factor analysis to assess the validity and internal consistency of the CM domains at baseline and endline. The focus group transcripts from 76 groups with 403 rural Zambians were analyzed using content analysis guided by the investigator and derived from a CM theory of change framework; a framework based on Weiss' established theory of change (Weiss, 1995). The focus group and survey data were merged with a concurrent mixed methods approach, using a joint display and unconstrained categorization matrix to increase the trustworthiness and reliability of our results (Creswell et al., 2014).

Theory of Change

One solution to measuring empowerment based interventions is the employment and application of theory of change (ToC), a logic model systems approach that includes intermediate and long-term outcomes based on context and population specific hypotheses, supporting realist evaluations (Weiss, 1995). The use of ToC suggests researchers create a map of expected outcomes tracing them back to inputs through evaluation of assumptions to understand what worked, or where assumptions were not accurate to understand expected or

actual intervention results (Weiss, 1995). This theory has been used to demystify complex community based initiatives for over twenty years, to create explicit planning about what researchers are trying to do in a specific situation and to create strong interventions that can be influential in policy realms (Weiss, 1995). The ToC framework has been used in community based interventions for maternal and child health in sub-Saharan Africa to guide analysis and evaluation as well as in public health efforts around a variety of issues globally (Gullo et al., 2017). Using ToC in empowerment based interventions allows researchers to propose which aspects of empowerment may specifically be influenced by their intervention. (Hernandez & Hodges, 2001). The ToC is appropriate for evaluating empowerment based interventions due to the intervention specific tailoring intrinsic to its design.

For example, the community mobilization (CM) ToC guiding our analyses focused on current community resources and how the resources can be used to support the larger goal of decreasing maternal mortality in addition to assumptions about expected impact of the intervention that supported its implementation (Figure 1). The CM ToC is one avenue to illustrate how an intervention evokes long-term outcomes using a logic model approach of intermediate outcomes and long-term outcomes (Kubisch & Weiss, 1995). Public health researchers suggest use of the ToC framework to improve the evaluation of complex health interventions, with roots in Freirean thought on change creation through empowerment (Breuer, Lee, De Silva, & Lund, 2016). The core factors needed to conceptualize a theory of change are rooted in community specific elements that identify and describe population specific needs, values, and infrastructure available to achieve the end goals (Hernandez & Hodges, 2001). Our CM ToC identified the CM intervention would drive increases in all of the community and individual domains of CM as an intermediate outcome. Ultimately, our model suggests that these

intermediate outcomes will influence decreases in maternal mortality and morbidity as a long-term outcome when met with responsive, quality healthcare. The parent study was conducted in Saving Mother's Giving Life legacy districts, a public-private partnership that used a health systems focused approach to improve childbirth services and timely emergency care in rural Zambia (Conlon, et al., 2019). The legacy district's focus on health services and systems provided the foundation for strong health infrastructure in our model, and in the parent study.

Our CM ToC suggests that facilitating community groups to: 1) identify barriers and facilitators to facility delivery, 2) prioritize actions, and 3) implement ongoing monitoring of solutions will result in increases across all of CM's suggested domains (intermediate outcome) and eventually, a decrease in maternal mortality (long-term outcome). The long-term outcomes will not be tested in our analyses, yet are accounted for in the parent study.

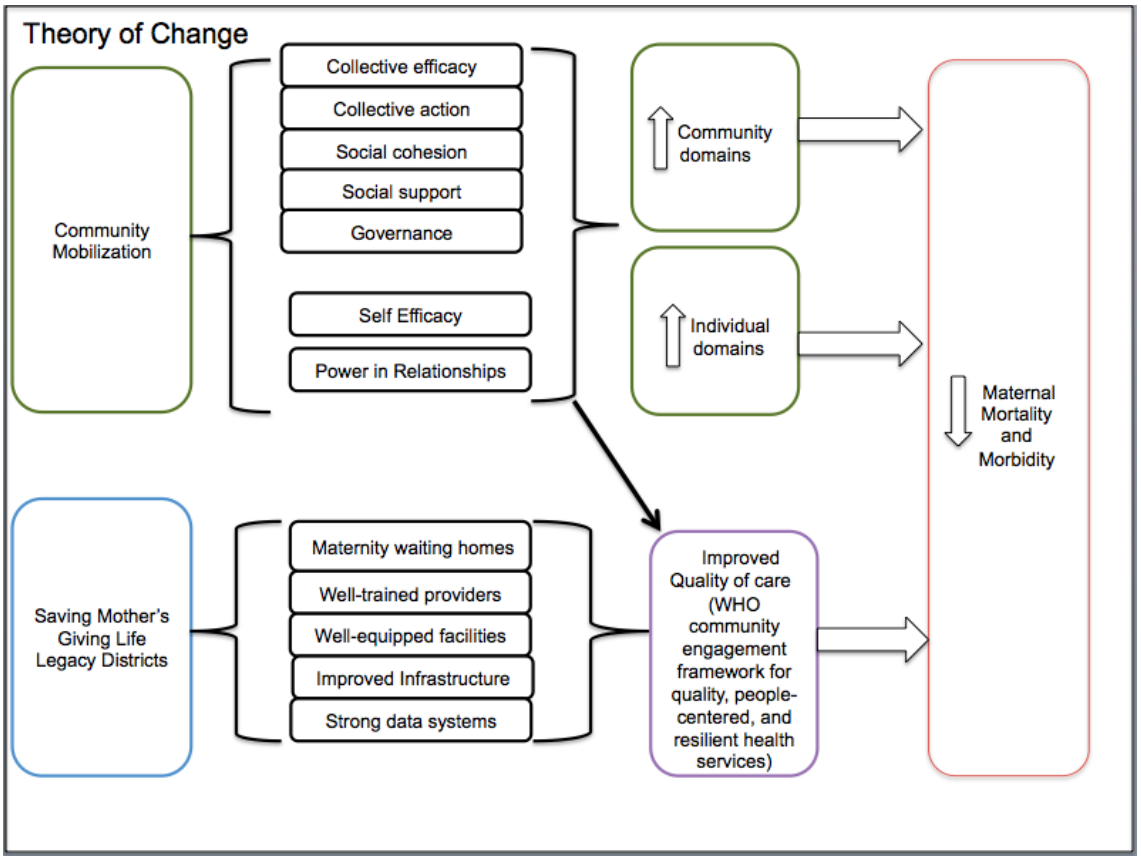


Figure 1. Community Mobilization Theory of Change

Aim 3. Describe the process that mobilizes communities in rural Zambia toward improved maternal health outcomes. To meet this aim a concurrent mixed methods approach will be employed (n=76 focus groups with 403 participants; N=1,203 CM survey participants).

Triangulating the results from Aims 1 & 2 using a convergent mixed methods approach will illustrate a more holistic understanding of the components integral to CM.

The results from Aims 1 & 2 were merged using a convergent mixed methods approach to provide a better understanding of the components of CM that enable change in care seeking behaviors for pregnant or laboring women (Creswell, Klassen, Plano Clark, & Smith, 2014; Fetters, Curry, & Creswell, 2013)

Community mobilization interventions for the reduction of maternal death have demonstrated effectiveness but research methods are unclear (Altman et al., 2015; Beck, Munro-Kramer, & Lori, 2018; Howard-Grabman, 2007, World Health Organization, 2014). The challenges in measurement of CM do not however, diminish its usefulness as a critical intervention for public health challenges. Translating how and why CM strategies work is necessary to advance global support for their implementation. Evaluating CM domain and qualitative data from the rural Zambian context have the potential to amplify evidence that these approaches are effective, garnering additional support for their use in low resource settings.

Nurses are well positioned to implement and advocate for holistic community engaged interventions that take into account the social determinants of health and work to disrupt harmful social norms. As clinicians, advocates, scientists, and leaders, nurses are intimately aware of the impact of social inequities on health. Bound by the American Nurses Association Code of Ethics, nurses have an obligation to work toward health as a universal human right, as described in provision eight of the code (American Nurses Association, 2015). Complex health and societal

problems, including maternal mortality, require multifaceted solutions that are driven by community led innovations. Without a premise of community engagement, nurse scientists will not be capable of producing interventions or research that are relevant or impactful.

Nursing professionals have an opportunity to stand at the forefront in advocating for interventions such as CM that have promising results yet require further research to obtain funding to be taken to scale. As medicine increasingly moves toward the individual, where precision medicine or concierge hospital services are considered innovative, nurses can work to shift research back to health needs of communities. Use of CM in low resource settings may look slightly different dependent on location and contextual need, yet represents a solution with great potential to impact change in a lasting manner. Understanding this process represents the first step in increasing scalability and use of CM and nurses can be at the forefront of its replication and widespread use.

Chapter 2 Literature Review

Introduction

The following review will examine the history of maternal and child health, including measurement controversies, global disparities, and maternal health specific to Zambia. In addition, Zambian history and the structure of healthcare in Zambia will be described, before focusing on maternal health in Zambia. The history and use of maternity waiting homes (MWH) as a global intervention to decrease maternal death will be examined, and then more specifically in low- and middle-income countries (LMICs). Finally, the history and evolution of community mobilization strategies will be outlined before defining community mobilization for the proposed study. Measurement challenges and operationalization of community mobilization will be reviewed, and gaps in the literature on community mobilization will be illustrated.

Maternal Health

In 1985, researchers called for scrutiny of maternal and child health (MCH) programs insisting that little was being done to avert the needless deaths of women and girls due to preventable pregnancy and childbirth related complications (Rosenfeld & Maine, 1985). Their call to action suggested a comprehensive system of maternity care, research, and policy reform to decrease preventable maternal deaths (Rosenfeld & Maine, 1985). Drawing on models developed a decade earlier, findings suggested that MCH centers should be built in rural areas, incorporate family planning, and include staff consisting of obstetricians, midwives, nurses, and other health professionals (Taylor & Berelson, 1971; Rosenfeld & Maine, 1985). By 1987, advocacy for the

reduction of maternal deaths culminated in the World Health Organization's (WHO) Safe Motherhood Initiative in Nairobi calling for heightened attention to women's overall well-being and the needless pregnancy and childbirth related deaths occurring around the world (Campbell et al., 2016). Despite several additional conferences and calls to action throughout the 1990s to the present day, women and girls continue to die due to three primary delays during pregnancy and childbirth: 1) delays in care seeking, 2) delays in reaching care, and/or 3) delays in receiving adequate care upon arrival to a facility (Thaddeus & Maine, 1991). Factors influencing maternal death are structural, influenced by social and cultural realities that imbue pregnancy and childbirth with higher risk for poor and/or marginalized women (Snow, Laski, & Mutumba, 2015), aligning with similar factors that influence the value women place on their own well-being, or their agency in care seeking and/or decision making (Moyer & Mustafa, 2013; Stephenson, Baschieri, Clements, Hennink, & Madise, 2006; Sundari, 1992) . Estimates suggest that currently 830 women and girls die every day due to preventable pregnancy and childbirth related etiologies such as: 1) hemorrhage, 2) sepsis, 3) pre-eclampsia/eclampsia, and 4) complications from unsafe abortion (World Health Organization[WHO], 2015).

Maternal Mortality

Maternal health and overall progress in development of health infrastructure is measured using progress indicators such as the maternal mortality ratio (MMR). Maternal death is defined using the International statistical Classification of Diseases and related health problems, 10th revision (ICD-10) as:

> The death of a woman while pregnant, or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management (from direct or

indirect obstetric death), but not from accidental or incidental causes (WHO, 2010*).*

Direct maternal deaths refer to complications related to the state of pregnancy that may occur due to interventions, lack of or incorrect treatment, or any chain of events relating to deaths that occur during pregnancy, delivery or the postpartum period (WHO, 2010). Indirect maternal deaths are those that occur due to previously existing diseases, or exacerbated by the state of being pregnant (WHO, 2010).

Building on the call to action initiated at the Safe Motherhood Conference in Nairobi, the Millennium Development Goals (MDGs) included goal 5, to reduce maternal death by three quarters between 1990-2015 and achieve universal access to reproductive healthcare. Progress was made toward the reduction of maternal deaths during the 15-year period of the MDGs, with an estimated decrease in maternal death by forty-seven percent. Yet, disparities remained in access to contraceptives, preventable pregnancy and childbirth related deaths continued as a leading cause of death for adolescent girls, and maternal deaths remained higher LMICs (United Nations, 2017). Brainstorming for the Sustainable Development Goals (SDGs) began in 2013 to include a set of inter-related goals that build on the momentum of the MDGs. The SDG 3.1 specifically proposes a decrease in maternal death around the world to no more than 70 deaths per 100,000 live births by 2030 (United Nations, 2017). Hypothesized to reflect health infrastructure, women's place in society, and access to healthcare, there were debates as to whether the use of the MMR was truly a comprehensive reflection of maternal health (Storeng & Béhague, 2017). Yet in countries where maternal death remains high, sustained attention on the burden of maternal mortality continues to be extremely important, with ongoing use of the MMR in global goal setting and targeted efforts to reduce maternal death (Campbell & Graham, 2006).

Measurement

The MMR examines the number of maternal deaths during a time period (generally 1 year) per 100,000 live births during the same time period (WHO, 2015). Although creating heightened advocacy to decrease maternal death was and is undeniably necessary, there are substantial critiques of the continued use of the MMR as a measure of maternal health (Storeng & Béhague, 2017), especially in LMICs. In today's neoliberal, public-private partnership dominated global health sphere, critics suggest that metrics like the MMR, once used as a call to action, have been misguided in their ongoing interpretation and use (Storeng & Béhague, 2017). During the Safe Motherhood Initiative's initial meeting in 1987, MMR metrics leveraged support for research and evaluation of programs to decrease maternal deaths (Storeng & Béhague, 2017). With good intention, unsound estimates of maternal death began to be used in advocacy and research, as many of the countries from which data were being estimated used a triangulation of methods, pulling data from weak or nonexistent civil registration systems (Snow et al., 2015; Storeng & Béhague, 2017).

The current use of the MMR receives ongoing criticism due to the pressure that researchers have to appease donor driven demands for singular metrics that do not capture a comprehensive view of maternal health (Storeng & Béhague, 2017). The use of this metric focuses interventions on women in the top 40% of socioeconomic status in order to show satisfying results to donors, while doing nothing for poorer women whose health outcomes and death rates may be more difficult to change (Storeng & Béhague, 2017; Sundari, 1992). Those who contend for continued use of the MMR suggest that better data is needed, especially among marginalized groups, adolescents, refugees, and those living in areas of war and conflict (Snow et al., 2015). Suggested solutions to the problem of measurement around maternal health include

shifting indicators of maternal health towards a focus on or integration of the MMR with process indicators that identify the quality, availability, and access to healthcare services, or a focus on maternal morbidity (Storeng & Béhague, 2017). Evaluating the agency of individuals and communities in guiding decision making about socio-culturally acceptable and desired care have also been suggested as progress indicators for maternal health interventions to be used alongside the MMR (Macfarlane, Racelis, & Muli-musiime, 2000).

Global Differences in MMR

Despite contested use of the MMR, its ongoing use informs policy and research illustrating gross inequities in the global concentrations of women and girls who continue to face preventable death (Snow et al., 2015), streamlining one clear primary outcome indicator (Campbell & Graham, 2006; Snow et al., 2015). Now approaching nearly 50 years of focused efforts to eliminate maternal deaths through goal setting and targets, with every minute, it is estimated that a woman or girl will die due to preventable pregnancy or childbirth related complications somewhere in the world (WHO, 2015). Countries designated as LMICs continue to bear 99% of the burden of these unnecessary deaths, losing an estimated three hundred thousand mothers every year (WHO, 2019). A high burden of maternal deaths occur in the sub-Saharan African region, with an estimated 66% of global maternal deaths (WHO, 2015). Examining the risk of death between countries reveals structurally driven inequity where, in a LMIC region such as sub-Saharan Africa (SSA) a girl's lifetime risk of maternal mortality is 1 in 45, in stark contrast to the risk in high-income countries where this risk is estimated at 1 in 5,400 (WHO, 2019). Estimates may in fact be much higher in reality, as data regarding maternal mortality are difficult to collect in countries with poor health infrastructure reported in aggregate

form as well as thought to conceal the gravity of the issue for indigenous women and other marginalized groups (Snow et al., 2015).

The evidence is clear that access to skilled care prior to, at the time of, and following delivery can prevent death and disability (Moyer & Mustafa, 2013: WHO, 2015). Pragmatically, the response in SSA and around the world has focused efforts on improving rates of facility based delivery and access to skilled attendants at birth (WHO, 2015). However, challenges remain in improving access to care due to infrastructure issues as well as multifaceted socio-cultural factors limiting use (Moyer & Mustafa, 2013; Snow et al., 2015; WHO, 2015). Research indicates the expansion of maternal health service use (including institutional delivery) requires complex interventions that simultaneously address access to education, poverty elimination, and women's empowerment (Ahmed, Creanga, Gillespie, & Tsui, 2010).

Zambia

Zambia is a landlocked country in SSA, originally settled by Khoisan and then Bantu people (Central Statistical Office [CSO] Zambia, 2014). European colonists took hold of the country during the 18th century, which re-gained its independence from the British in 1964 (Gewald, J., Hinfelaar, M., & Macola, G., 2005). Despite copper mines and land rich with agricultural potential, corruption and mismanagement decreased the economic well-being of the majority of citizens by 1971 (Gewald et al., 2005. One-party rule persisted in Zambia until 1991 with persistent economic disparities influencing the health and well-being of citizens (Gewald et al., 2005). Poverty remains an overarching concern in Zambia, with 78% of the rural population and 28% of urban populations living in poverty, defined as living without access to income, opportunities, employment, shelter, and other basic needs (CSO Zambia, 2014).

Healthcare in Zambia

Health infrastructure in Zambia remains largely centralized in urban areas, with health posts and rural health facilities supported by urban centers with higher care capabilities. Rural Zambians are at higher economic disadvantage with associated increased risk for morbidity and mortality in the setting of weak health and social infrastructure, influencing higher travel and time costs when seeking healthcare (Hjortsberg & Mwikisa, 2002). In 2011, the Zambian government began attempts to prioritize rural areas through their National Health Strategic Plan (NHSP), with a focus on decentralized care (Ministry of Health [MOH] Zambia, 2017). The current NHSP (2017-2021) continues to emphasize the need to increase primary care access and engage urban centers in providing support to rural care centers (MOH Zambia, 2017). Primary care in Zambia is structured around health posts, rural health centers, and district hospitals. Communities are engaged through use of neighborhood health committees and environmental health technicians, although challenges remain in the strength of referral systems, consistent staffing of nurses and midwives, supply chain management and drug stock-outs (MOH Zambia, 2017). The NHSP (2017-2021) specifically addresses the need to improve maternal health in rural areas of Zambia, focusing on the reduction of maternal mortality as a process indicator. Yet challenges remain in providing adequate maternal health care, with 31% of mothers delivering at home, and women in the lowest wealth quintiles or youngest age less likely to have a facility birth (CSO Zambia, 2014).

Maternal Health in Zambia

There are 72 distinct ethnicities with unique cultural practices and beliefs in Zambia that influence health choices and behaviors. Although cultural influences can promote health, there are some practices that persist across Zambia such as favoring education of the boy child,

childhood marriage, or gender inequities in the home or workplace that disfavor health and well-being for all (CSO Zambia, 2017). Gendered inequities in Zambia influence maternal health in particular, with Zambia's MMR at 252 deaths per 100,000 live births (CSO Zambia, 2019; Kwaleyela & Greatrex, 2015). Accessing care is implicated as a factor influencing maternal health outcomes, with continued barriers identified including cost, distance to facilities, lack of awareness of need for care, poor quality care, and cultural beliefs about childbearing (Phiri, Fylkesnes, Ruano, & Moland, 2014; Sacks et al., 2017; Sialubanje, Massar, Hamer, & Ruiter, 2017; Sialubanje et al., 2015).

Saving Mothers Giving Life (SMGL) launched in 2012 as a five year public-private partnership aiming to reduce maternal death in Zambia and other countries coping with high rates of maternal death (Conlon et al., 2019). Eighteen rural districts in Zambia were selected for the project with an overall reduction of maternal death in these districts by 41% over the five-year project (Conlon, et al., 2019). The SMGL initiative used a systems approach to improve health systems strengthening, enhance networks of referral, and increase demand for health services (Conlon et al., 2019; Serbanescu et al., 2019). Training was provided to community members, known as Safe Motherhood Action Groups (SMAGs) who share information in communities in a socially and culturally acceptable manner about the importance of facility delivery, birth planning, healthy behaviors during pregnancy and care of the newborn/infant (Conlon et al., 2019). Over the course of the intervention, facility delivery increased from 63% at baseline to 90% at endline in targeted communities with 96% of facilities in target districts working with active SMAGs (Conlon et al., 2019). A key element in the SGML intervention in Zambia focused on increasing access to facility deliveries, often challenging for rural women

who live far distances from a facility, in part through implementation of MWHs (Scott et al., 2018).

Maternity Waiting Homes

Maternity waiting homes are one component of a package of interventions to reduce maternal death around the world (WHO, 1996). These non-clinical buildings are generally adjacent to a facility capable of providing emergency obstetric care, providing shelter for pregnant women and girls to await delivery as their due date approaches (Luc Van Lonkhujzen et al, 2015; WHO, 1996). Shelters providing social support and housing for pregnant women and girls in North America and Europe began operating in the early 20th century (Aday & Anderson,1974; Liebman, 1995). Use of MWHs in the effort to reduce maternal death in LMIC is not a new concept, with record of use of 'antenatal waiting homes' since the 1950s to address the problem of geographic distance to a facility in areas of the world where decentralizing care and/or emergency transport create challenges (Sundari, 1992; WHO, 1996). However, the concept and implementation of MWHs have evolved over time, with early MWHs in LMICs built under the premise that women considered 'high risk' due to obstetric abnormalities would stay in the shelters (Luc Van Lonkhujzen et al, 2015; WHO, 1996).

This concept changed as women considered 'high risk' then began to include all pregnant women (WHO, 1996). Experimentation with MWHs in LMICs including Nigeria and Uganda began in the 1960s with promising results (Lawson & Stewart, 1968; Minkler, 1972). In Nigeria use of MWHs reduced maternal death from 10 per 1,000 births down to 1 per 1,000 births, and in Uganda, the maternal mortality ratio was reduced by half in one of the rural and remote districts that implemented MWHs (Lawson & Stewart, 1968; Minkler, 1972). The Cuban government began experimenting with the MWH model in the 1960s, establishing nearly 100 MWH by the

1980s, with an associated decrease in maternal deaths from 32 per 100,000 births to 2 per 100,000 births (Luc Van Lonkhujzen et al, 2015).

This early evidence led to the promotion of MWHs as an intervention to reduce maternal mortality in LMICs for women considered high risk who lived far geographical distances from a facility capable of emergency obstetric services to reduce the burden of time and distance in accessing services (Luc Van Lonkhujzen et al, 2015). In response, MWH were constructed globally in a variety of countries per the direction of government entities, academic or non-profit institutions (Luc Van Lonkhujzen et al, 2015; WHO, 1996). Without stringent guidelines, each MWH was designed and implemented per each governing body with room for unique socio-cultural preference (WHO, 1996). Over time, the need for guiding frameworks became evident due to the lack of quantitative evidence for use of MWHs and the variety of designs and implementation models occurring around the world. Evaluations of risk selection in identifying which pregnant women would benefit the most from using a MWH revealed that provider's predictions are not always successful, with an estimated 20% of all pregnancies resulting in the need for some form of emergency obstetric care (Luc Van Lonkhujzen et al, 2015). Today, use of MWHs are encouraged for all pregnant women in some LMICs to promote facility deliveries, increasing the availability of emergency obstetric services and skilled attendants at birth, and are generally one piece of a comprehensive package of interventions (WHO, 1996).

An important lesson and current recommended strategy prior to building a MWH is the need to involve women and community members in planning for implementation to promote socio-cultural appropriateness, uptake, and sustainability (Lori et al., 2013; McIntosh et al., 2018; Penn-Kekana, et al., 2017; Ruiz et al., 2013; Sialubanje et al., 2016; WHO, 1996). Research on MWHs has indicated that these lifesaving structures may go under or unused in

some circumstances (Mramba et al., 2010). An early MWH implementation in Ghana placed the structure near an old mortuary, which post-focus group discussions with women indicated was not an appropriate location, decreasing likelihood of use (Wilson et al., 1997). Further research has investigated potential barriers to use of MWHs to include concerns about cost (Mramba et al., 2010; Sialubanje et al., 2015; Ruiz et al., 2012), lack of awareness of the MWH or need to use it (Mramba et al.,2010; Sialubanje et al., 2015)), concerns about being away from home and associated duties (Sialubanje et al., 2016), lack of autonomous decision making of pregnant women (Sialubanje et al., 2017), concerns about the design or accommodations provided at the MWH (Sialubanje et al., 2017), and/or concerns about lack of staff presence or quality of care provided(Lori et al., 2013; Penn-Kekana et al., 2017; Sialubanje et al., 2017). Features important to women in a Malawian MWH cross-sectional study indicated that safety, space for family members or friends accompanying the pregnant woman, toilets/showers, sleep areas, and private storage space were the most important features to consider in designing MWHs (McIntosh, Gruits, Oppel, & Shao, 2018). Research in Zambia echoed similar preferences for the amenities at MWHs, adding the need for privacy, food security, and transportation (Chibuye, Bazant, Wallon, Rao, & Fruhauf, 2018). Few MWH implementation studies demonstrate use of participatory approaches in the design and long term sustainability of the homes.

Facilitation of MWH use is more likely when community members and women are involved in the design, implementation and ongoing daily activities and sustainability of the shelter, when there is no cost associated with use, community engagement raises awareness about the shelter, the facilities are well kept, and care provided is of high quality (Lori et al., 2013). In Zambia, participants in focus group discussions expressed willingness to pay a small amount to stay at a MWH, provided that the shelters were safe, provided a space for family to

stay, included cooking facilities, and was near a facility providing high quality services (Penn-Kekana et al., 2017; Vian, White, Biemba, Mataka, & Scott, 2017), reflecting an emergent demand for MWHs and community interest in sustainability. However, the evidence is clear that without active community engagement and participation throughout the process of designing, implementing, day-to-day operations, and ongoing sustainability the success of any MWH is jeopardized (Penn-Kekana et al., 2017).

Community Mobilization: Origins

Community mobilization (CM) through participatory learning and action cycles using women's groups has been recommended by the WHO as a best global intervention for low resource settings in efforts to reduce maternal and neonatal mortality (WHO, 2014). This strategy is not supported by a definition that is universally adhered to, as each context requires unique tailoring to local needs (Beck et al., 2018; Lisa Howard-Grabman, Miltenburg, Marston, & Portela, 2017). However, for the purposes of this review, CM is understood as outlined in the following definition, "a capacity-building process through which community members, groups, or organizations plan**,** carry out, and evaluate activities on a participatory and sustained basis to improve their health and other conditions, either on their own initiative or stimulated by others," (Howard-Grabman, et al., 2007, p. 5). The use of CM to prevent maternal death can address the Every Woman Every Child (EWEC) Global Strategy for Women's, Children's, and Adolescents' Health (2016-2030), which demands action on three main agenda items, 1) *Survive* (end preventable deaths), 2) *Thrive* (ensure well-being), and 3) *Transform* (expand enabling environments) through its capacity building, participatory action, and empowerment based framework (WHO, 2017). The evolution of CM has evolved from a long history of community participation in health.

History of Community Participation & Health

In the 1960s and 1970s and inspired by the primary care movement, various health projects in China (barefoot doctors), Mexico (health workers), and India (Jamkhed program) used the power of primary care to improve health. They used a human rights approach that demystified and de-medicalized preventive and curative community based care (Mann et al., 1988; Werner, 1978). Simultaneous community approaches were being developed across Central America by sociologists such as Orlando Fals Borda, one of the founders of participatory action research, and radical educators like Paulo Freire (Wingenfeld & Newbrough, 2000). Their work, coupled with influences across Central America and the United States paved the foundation for the field of community psychology, which examines the psychosocial influences on the development, promotion, and maintenance of control and power by citizens over their individual and social environment (Wingenfeld & Newbrough, 2000).

In the early 1970's the joint WHO and United Nations International Children's Fund published an investigation into alternative approaches for meeting the basic health needs of populations through approaches that incorporated beyond curative-only strategies (Litsios, 2004). This collaborative approach was instigated following malaria eradication programs that highlighted the need to address poor health infrastructure and lack of basic services to have impact. This work was influenced by the work of the Geneva Christian Medical Commission's increasing use of community-based strategies to address the health needs of people living in impoverished communities, through income generating activities to increase accessibility of care and education programs (Litsios, 2004). Despite positive intentions of more bottom up approaches to community based health care, it is important to note that the income generating activities favored Western, neoliberal ideals. This neoliberal agenda may have had simultaneous

negative consequences in the same communities they were aiming to assist, such as the devaluing of community cooperation or indigenous systems of bartering and community self-sufficiency. Nevertheless, by 1978 community based approaches began infiltrating healthcare agendas, with the Alma Ata Declaration on Primary Health Care and its slogan of 'Health for All by 2000' encouraging healthcare providers and activists to promote a bottom up approach, renouncing the idea that health is driven by technical, medically focused solutions alone (WHO,1978).

The Alma Ata Declaration insists that health is a technical, social, and political issue, directly opposes health inequities, and calls for people's participation as a right and duty (WHO, 1978). Despite this radical rallying cry in 1978 and the promotion of primary care as the policy of the WHO member states, by 2000, the goal of health for all was not achieved. A year following Alma Ata, the push for selective primary care, or choosing to treat those diseases that would have the greatest impact on health, diverted the importance of community involvement and social change back to the importance of a medicalized approach (Walsh & Warren, 1979). Solutions to health problems became hyper-focused, using things like oral rehydration solution, Vitamin A tablets, or immunizations, with an assumption that the recipients of the preventative care were both poor and passive (Rosato et al., 2008). However, continuing in the traditions of Alma Ata, eight non-governmental organizations united to create the People's Health Movement, holding their first meeting in December of 2000 in Bangladesh where 1,500 people from 91 countries came together to launch a People's Health Charter (People's Health Movement [PHM], 2000). The People's Health Charter reiterates the importance of people centered healthcare with a foundation in comprehensive primary healthcare for all, grounded in broader social change, with health as a human right (PHM, 2000). The Director General of WHO from the time of the

Alma Ata conference was present and endorsed the People's Health Charter in 2000, although notably no other senior staff from the WHO attended the People's Health meeting (WHO, 2017). Nonetheless, by 2017, the WHO came out in direct support of the use of community engagement frameworks for people-centered and resilient health services, having learned lessons about the importance of deliberate and informed community engagement following the 2014-2016 Ebola crisis in West Africa (WHO, 2017).

Participation, Mobilization, & Empowerment

Participation, mobilization, and empowerment are related concepts as they pertain to community involvement and in setting healthcare priorities. Participation refers to engagement and involvement of a community, which is active or passive in nature (Rosato et al., 2008). The continuum of participation is thought to begin in its most passive state with co-option, where there is tokenistic involvement with local people, but no real power or input from those people, through to collective action, where local people decide and set their own agenda of issues to address and carry the agenda out in the absence of outside facilitators (Howard-Grabman, 2007). Collective action is considered to be the highest form of community participation, with co-learning as a stepping stone just beneath it along the continuum. Co-learning is suggested to be a process where locals and outsiders engage in knowledge sharing to generate and initiate action plans with

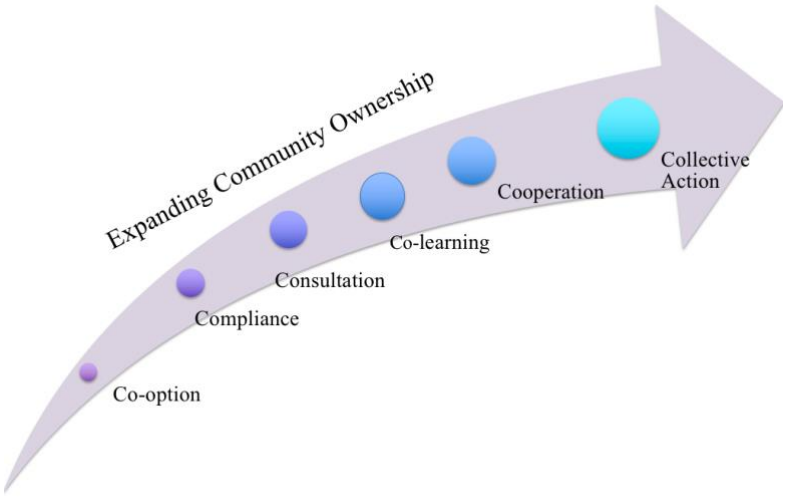


Figure 2. Degrees of Community Participation (Howard-Grabman et al., 2007)

outside facilitation, and is closest to the current form of CM that exists today (Figure 2) (Howard-Gramban, 2007).

Mobilization of communities in regard to their healthcare initially relied on passive models of involvement where healthcare professionals directed the health agenda for the communities and usually without meaningful community input (Howard-Grabman, 2007; Rosato et al., 2008). These early models of CM relied on strategies rooted in selective primary care models such as use of mass media, mass immunization campaigns, or various other processes where community members were targeted and treated as passive recipients in a well-meaning, albeit paternalistic model (Howard-Grabman, 2007; Rosato et al., 2008). Beginning around the 1990s, CM strategies began employing new tactics, where health and development workers began employing a facilitation-based model of CM attuned to both the process and outcomes related to health changes and improvements (Howard-Grabman, 2007; Rosato et al., 2008). With this approach, which focused on the health or development worker as a facilitator, there was a larger focus on empowerment (Howard-Grabman, 2007).

Empowerment. Empowerment is a challenge to define because there is no universally accepted definition. It is a contextually based concept and thus, the definition is influenced by culture and gendered nuances that are not universally accepted nor defined (Gram, Morrison, & Skordis-Worrall, 2018; Hashemi, Schuler, & Riley, 1996; Malhotra & Schuler, 2002; Schuler & Hashemi, 1994). This construct is measured by a variety of disciplines in different ways including: 1) as individually or community based, 2) as a process or an outcome, 3) based on removing external or internal psychological barriers, 4) requiring individuals to gain independence or rely on others to expand their agency through social support, and/or 5) as an evaluation of the number of present options or reasons behind past choices (Gram et al., 2018;

Malhotra & Schuler, 2002). Often empowerment based interventions do not measure individual/psychological empowerment or community empowerment due to challenges with measurement, instead focusing on things like knowledge, attitudes, and behaviors (Schulz, Israel, Zimmerman, & Checkoway, 1995; Zimmerman, 2000). Empowerment includes both individual beliefs and practices in addition to beliefs and behaviors at interpersonal, organizational, and community levels, which are reflexively interdependent (Schulz et al., 1995; Zimmerman, 2000). The principles guiding empowerment based approaches orient towards the goals, intentions, and approaches used to create interventions for social change (Schulz et al., 1995; Zimmerman, 2000). The value orientation of empowerment focuses on the positive aspects of a situation, enhances wellness, where participants are viewed as change-agents within their larger socio-environment, taking a public health approach (Schulz et al., 1995; Zimmerman, 2000).

Empowerment Theory

Use of empowerment theory guides the selection of measures and distinguishes the empowerment construct from similar constructs that focus on personal competence or positive self-image such as self-efficacy, or locus of control (Zimmerman, 2000). Empowerment theory stipulates that: empowerment is positive and proactive; includes processes and outcomes; and suggests that elements of the process are influential in varying levels of outcomes (Zimmerman, 2000). The outcomes and processes of empowerment vary considerably in the way in which they materialize due to the extreme variation across contexts and populations (Schuler, Islam, & Rottach, 2010; Zimmerman, 2000). Empowering processes include progress towards gaining the skills, knowledge, and ability to critically assess one's socio-environment, actualized in different forms at individual, interpersonal, and organizational levels (Zimmerman, 2000). Empowering outcomes focus on empirical indicators that can be measured to assess the impact and

culmination of empowering processes, such as working towards increasing community control or the impact of an empowerment based intervention (Zimmerman, 2000). Use of empowerment theory requires context and population specific analysis at the individual, interpersonal and community level due to the interdependence and influence each component has on the other (Schulz, Israel, Zimmerman, & Checkoway, 1995; Zimmerman, 2000). In addition, use of empowerment theory or frameworks should be context and population specific and avoid shifting responsibilities from local and state government (Schulz et al., 1995; Zimmerman, 2000).

Individual/Psychological Empowerment

Empowerment at the individual level is referred to as psychological empowerment, which incorporates personal beliefs about one's abilities, actions taken to gain control, and a critical comprehension of one's socio-environment (Zimmerman, 2000). These components of psychological empowerment can be built or improved on through engagement with activities and organizations that create space for learning, connecting with others in the community, and increasing confidence (Zimmerman, 2000). The key components included under the construct of psychological empowerment are intrapersonal, interactional, and behavioral with no order or sequential relationships to one another (Figure 2) (Zimmerman, 2000). These three components of psychological empowerment are uniquely apparent and/or absent in each individual to varying

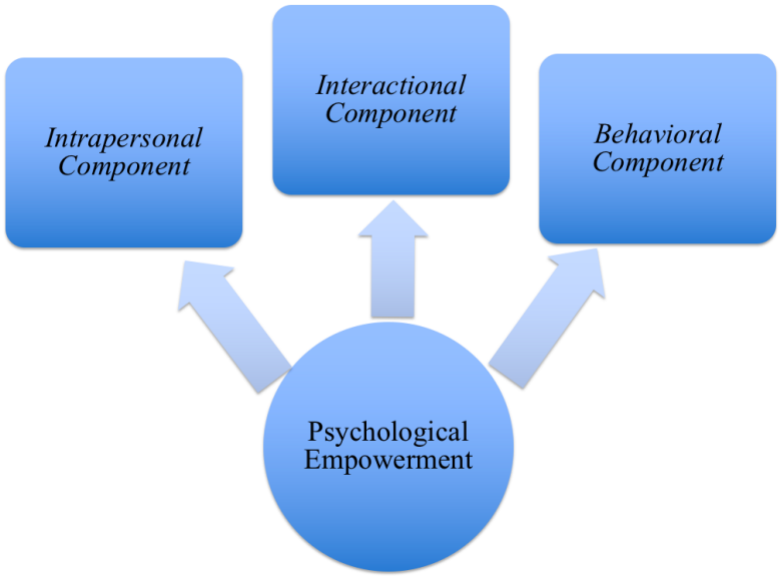


Figure 3. Psychological Empowerment (Zimmerman, 2000)

degrees. The intrapersonal component includes three subcomponents: 1) personality (*locus of control*), 2) cognitive (*self-efficacy*), and 3) motivation (*perceived control*) (Zimmerman, 2000). The subcomponent of perceived control can also be measured at the interactional or behavioral level of analysis (Zimmerman, 2000). The interactional component refers to the application of critical consciousness through problem-solving skills in addressing problems in the socio-environment (Zimmerman, 2000). Finally, the behavioral component is realized through actions taken to exert control over one's environment through participation in community activities or organizations (Zimmerman, 2000). In an individual considered to be at their full capacity in terms of empowerment all three components of psychological empowerment would be present, although any amount of any one of these components indicates some level of empowerment (Schulz et al., 1995; Zimmerman, 2000).

Community Empowerment

Empowered communities are defined by three main characteristics, 1) ongoing community led improvement initiatives, 2) responsiveness to threats to quality of life, and 3) the provision of opportunities for citizen participation (Zimmerman, 2000). For an empowered community to manifest, structural components of the community also need to be in place including strong relationships between organizations and coalitions that can be responsive to citizen engagement (Howard-Grabman, 2007; Zimmerman, 2000). In addition, accessible resources for recreation, healthcare, civil infrastructure, media resources, and bottom-up pluralistic leadership and leaders are necessary structural pieces to create an empowered community (Zimmerman, 2000). Similar to the concept of individual/psychological empowerment, it is essential that community empowerment be understood as population and context specific (Howard-Grabman, 2007; Zimmerman, 2000).

Community Participation & Empowerment

Interdisciplinary scholars, activists, researchers, and policy makers have argued for the facilitation of enabling environments through interventions designed with community participation and similar empowering processes for decades (WHO, 2017). Community participation in the design, implementation, and ongoing management of health related interventions, such as MWHs are crucial to their success (Lori, Munro-Kramer, Mdluli, Musonda, & Boyd, 2016; Lori et al., 2013). Additional benefits of active community participation are the potential to drive empowering processes and outcomes at both individual and community levels (Zimmerman, 2000), leaving behind a uniquely sustainable yet difficult to visualize and often challenging to measure, transformation (Altman et al., 2015; Costello, 2018). Yet, mere participation in community activities may not have the intended empowerment-based effect because participants behave as passive recipients rather than partners (Howard-Grabman, 2007). Analysis of the degrees of community participation suggests that participation can take many forms, at its lowest involving tokenistic involvement of local people, and at its highest form embodied as collective action (Howard-Grabman, 2007). The focus in public health interventions for maternal health then should aim for the highest levels of participation, said to expand community ownership of intervention goals, and simultaneously create enabling environments for citizen engagement (Howard-Grabman, 2007). A suggested co-learning strategy to address the complex problem of maternal death is known as community mobilization.

Community Mobilization

Community mobilization is an empowerment based, capacity-building strategy that addresses health inequities through purposeful engagement as a process, with a unique emphasis on collective advocacy (Howard-Grabman, 2007). Used among marginalized and hard to reach

populations for the prevention and treatment a variety of reproductive, maternal, newborn and child health interventions, CM has gained traction as an important public health approach (Howard-Grabman, et al., 2007; WHO, 2014; WHO, 2017). Despite decades of CM interventions and research using this approach, publication of resource guides and recommendation for use by UNAIDS, WHO, and CDC, challenges remain in understanding and reporting on measurable outcomes from the process (Altman et al., 2015). There are few studies that report CM results using causal chain analysis evaluations to identify core components necessary to drive the process, and few that evaluate broader social outcomes such as changing social norms or gender transformation (Altman et al., 2015; Howard-Grabman et al., 2017; WHO, 2017). The following text will explore the history of CM approaches, CM for maternal and child health, and the measurement and operationalization of CM for maternal and child health.

First generation CM approaches

One way to describe different manifestations of CM approaches is through use of a 'three generation' analysis exploring how CM approaches have changed and how they vary in engagement and empowerment of communities. While useful in categorizing changes that have occurred in how CM is enacted, in reality these 'generations' of approaches overlap at times, yet this generational approach can be useful to describe the evolution of this strategy (Campbell, Cornish, Gibbs, & Scott, 2010). Use of CM for HIV prevention and treatment efforts grew out of the evolution and trial and error of using individual and peer group approaches in attempts to prevent, treat, and decrease transmission of HIV among vulnerable populations (Campbell & Cornish, 2010). First generation refers to individual approaches such as those used to combat the spread of HIV that began to evolve in the late 1980's and early 1990's. These approaches were

criticized as crudely assuming that behavior change was dependent on providing information to passive recipients, ignoring social context (Campbell & Cornish, 2010).

Second generation CM approaches

Health psychologists argued that first generation approaches largely focused on the individual contributed to the spread of the HIV/AIDS epidemic by providing an avenue for the larger structural factors influencing behaviors related to the disease (Campbell & Cornish, 2010). By the mid- to late 1990's, second generation approaches focused entirely on the use of peer-to-peer education and support became more widely used, with some success among homosexual men in the United States (Kegeles, Hays, & Coates, 1996). Although peer approaches worked well in high income countries among those already connected socially, able to leverage social capital to achieve the support of those in power, in LMICs, peer approaches were not as successful (Campbell & Cornish, 2010). In LMICs, peer approaches did not function as well due to subversion by four main factors: 1) low levels of perceived agency among marginalized groups, 2) lack of solidarity among those in the group, 3) lack of social capital and support from those in the community, and 4) lack of support from health and social service institutions in the community (Campbell, 2003). Peer approaches used in LMICs that employ dialogue to engage participants in their educational approach are more likely to increase needed agency, critical thinking skills, and social cohesion in opposition to peer groups where the transmission of knowledge is linear, with the peer educator as expert (Campbell & Cornish, 2010). Despite promise in the dialogical education using a peer group approach, critics suggest that this type of intervention, in the absence of what has been termed a 'health enabling environment' has minimal potential for sustainability (Campbell & Cornish, 2010; Howard-Grabman et al., 2007).

Third generation CM approaches

Finally, third generation CM approaches address the need to incorporate context specific changes required in the socio-environment to create a health enabling atmosphere(Campbell et al., 2010; Romero, Wallerstein, Lucero, Fredine, & Module, 2006; WHO, 2017).This is more conducive to individual and community level health related behavior change as it goes beyond peer based approaches(Campbell et al., 2010; Romero, Wallerstein, Lucero, Fredine, & Module, 2006; WHO, 2017). Third generation approaches emphasize the need to incorporate community level change and emphasize the contextual realities that may foster success or failure in CM approaches. In particular, the health enabling environment, which includes responsive leaders and health officials are a necessary component for success (Campbell et al., 2010). For example, the Entabeni Project, a community mobilization intervention addressing HIV/AIDS in South Africa was successful in building the capacity of marginalized women to improve HIV/AIDS management in their community, but ultimately failed as the women's efforts to invoke structural level changes were consistently undermined by community leaders and public sector health officials (Campbell et al., 2010). A CM strategy using a very similar approach in India, the Songachi project, flourished in a socially and politically supportive environment, increasing condom use and decreasing sexually transmitted infections in the project areas (Cornish & Campbell, 2009). Use of 'third generation' CM approaches have been implemented in HIV prevention efforts in sub-Saharan Africa, South East Asia, Latin America and the Caribbean (Cornish, Priego-Hernandez, Campbell, Mburu, & McLean, 2014). These interventions indicated CM's effectiveness in reducing sexually transmitted infections and increasing condom use among sex workers, showed some evidence in increased condom use among men who have sex with men, but none showed consistent social outcomes or reported social outcomes in the same

way (Cornish et al., 2014). Challenges remain in defining and measuring CM approaches, which have been operationalized and reported on in many different ways reflecting a need to tailor CM to each unique context in addition to the ongoing obscurity of the concept itself and the need for standardization to promote successful scale up of CM activities (Altman et al., 2015; Tedrow et al., 2012).

CM for Maternal and Neonatal Health

One area where CM has shown consistently promising results is in the field of maternal and neonatal health. Community mobilization interventions are currently recognized as a key pillar in operationalizing the United States Agency for International Development's (USAID) strategic framework to end preventable maternal mortality (WHO, 2015). One of the original CM projects for maternal and neonatal health in rural Bolivia, the Warmi project (warmi means woman in local languages Quechua and Aymara), decreased neonatal mortality by 67% over three years and demonstrated improved knowledge and practices related to breastfeeding, care of the newborn, immunizations, and family planning (Howard-Grabman, 2007).

The Warmi project provided a blueprint for CM interventions for maternal and neonatal health as well as a useful definition, where CM is broadly defined as, "a capacity-building process through which community members, groups, or organizations plan**,** carry out, and evaluate activities on a participatory and sustained basis to improve their health and other conditions, either on their own initiative or stimulated by others," (Howard-Grabman et al., 2007, p. 5). With this definition of CM, the community is defined as a geographical area with shared interests, identity, characteristics, and resources (Howard-Grabman, 2007). The process of CM is structured around the community action cycle, a four phase regenerative strategy where community members: 1) identify/prioritize problems, 2) plan for action, 3) implement strategies, and 4) assess the process (Howard-Grabman, 2007) (Figure 4).

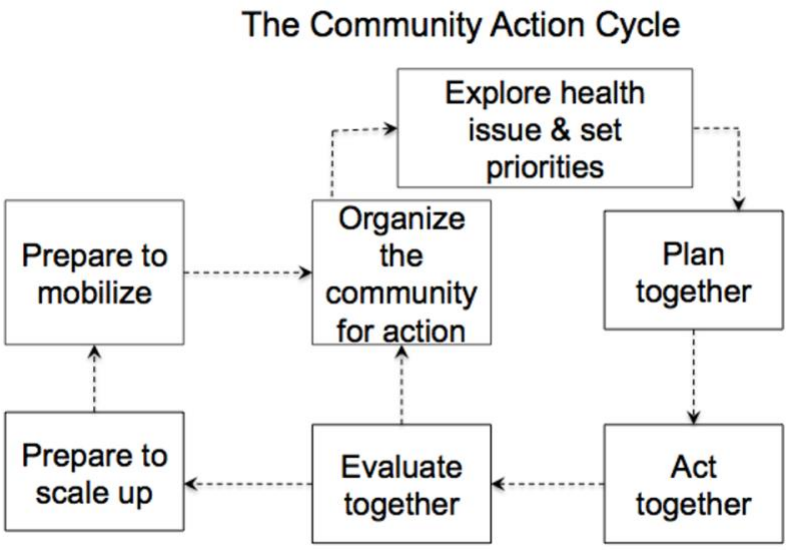


Figure 4. The Community Action Cycle (Howard-Grabman, 2007)

Globally, in communities where women's groups have been facilitated using the community action cycle, women become the locus of power in identifying problems, mobilizing resources, and acting to solve them effectively (Nair, Tripathy, Costello, & Prost, 2012; Tripathy et al., 2010; Victora & Barros, 2013). In the Warmi project, there were reductions in both neonatal and maternal mortality; however, the numbers were too small to establish significance and maternal mortality was a secondary outcome (Gonzales & Howard-Grabman, 1998).

Similarly, several CM interventions focused on the reduction of maternal and newborn death in South East Asia with neonatal mortality as the primary outcome and maternal death as a secondary outcome, have shown decreases in neonatal death (Nair et al., 2012), but conclusions are constrained by a small amount of trials (seven) restricting meta-analyses for potential sources of heterogeneity and bias (Prost et al., 2013).

One of the earliest large scale randomized CM interventions using women's groups in Nepal representing 6,725 births found a reduction in neonatal death by 30% (OR 0.70, 95% CI 0.53-0.94) over the 5 year trial (Manandhar et al., 2004). The Ekjut trial, which took place in rural Bangladesh, conducted CM through women's groups and found reductions in neonatal death by 45% (OR 0.55, 95% CI 0.46-0.66) over the two year intervention, representing outcomes for 19,030 births (Tripathy et al., 2010). This trial also showed decreases in neonatal mortality by 32% in the intervention areas (OR, 0.68, 95% CI 0.59-0.78) and by 45% in years 2 and 3 (OR 0.55, 95% CI 0.46-0.66) of the project (Tripathy et al., 2010). Maternal depression was a secondary outcome under investigation, but did not show a significant effect overall, however the scale used to assess maternal depression was not validated for the context in which it was used, and moderate depression was decreased by 57% in year 3 of the project (OR 0.43, 95% CI 0.23-0.80) (Tripathy et al., 2010).

In SSA, CM interventions for maternal and child health have focused on changing social practices that influence maternal and child health such as female genital cutting (Babalola et al., 2006); safe abortion care (Undie et al., 2014); community distribution of misoprostol to decrease post-partum hemorrhage (Ejembi et al., 2017; Prata, Ejembi, Fraser, Shittu, & Minkler, 2012); and/or education on a variety of maternal and child health topics including maternal and child dietary practices, modern family planning (Babalola et al., 2006; Gullo et al., 2017; Zamawe &

Mandiwa, 2016), prenatal, postnatal, and safe newborn practices (Ekirapa-Kiracho, Muhumuza, Tetui, & Namazzi, 2017; Mseu, Nyasulu & Muheriwa, 2014) and intimate partner violence (Wagman et al., 2015). Interventions that used CM to focus directly on reductions in maternal and child mortality included those that trained community health workers and traditional birth attendants (Boone et al., 2016), incorporated team training using local competencies in addition to maternity waiting homes (Lori et al., 2013), or combined quality improvement at the facility level with community interventions led by women's groups (Prost et al., 2013) (Table 1) .

Table 1. Effect of CM in SSA for maternal & child health (Beck et al., 2018)

Authors & Year	Effect of Community Mobilization
Babalola et al. (2006)	CM effective at decreasing FGC
Babalola et al. (2001)	CM is an effective method of increasing use of clinic services & FP impact higher in one district than the other
Boone et al. (2016)	CM effective in decreasing maternal deaths, but not under 5 mortality
Colbourn et al. (2013)	CM and quality improvement decreased neonatal mortality, CM alone decreased perinatal mortality, no impact on maternal mortality
Colbourn et al. (2015)	Article assessed cost effectiveness only, indicated CM as a cost effective strategy
Ejembi et al. (2014)	CM effective in supporting a sustainable, culturally acceptable, distribution of misoprostol at community level.
Ekirapa Kiracho et al. (2017)	CM effective in increasing in ANC visits & safer newborn practices
Gullo et al. (2017)	CM effective in building capacity of community members and healthcare providers, as well as influencing health practices and satisfaction
Guyon et al. (2009)	CM intervention key in increasing and improving breastfeeding practices
Lori et al. (2013)	Not assessed directly, although CM intervention increased team births and health facilities with MWHs had lower rates of maternal & perinatal death
Mburu et al. (2012)	CM increased awareness of those unable to be reached by the healthcare system and encouraged male participation
Mseu et al. (2014)	CM increased awareness of need for ANC and breastfeeding.
Muzyamba et al. (2017)	Causal links exist for empirical evidence linking CM to better health outcomes for HIV negative women; this is lacking for HIV positive women
Prata et al. (2012)	CM messages about PPH & misoprostol reached 80-90% of women, with a high retention of knowledge
Rosato et al. (2012)	Not assessed directly, although CM women's groups increase awareness/knowledge and build capacity
Undie et al. (2014)	CM raised awareness of FP methods and early pregnancy bleeding.
Wagman et al. (2015)	CM intervention resulted in decreased intimate partner violence at second follow-up (35 months)

Wekesah et al. (2016)	3 studies indicated that CM increased the level of health information related to danger signs and risk factors in pregnancy, first ANC visits, health facility use, and deliveries
Zamawe et al. (2016)	Not assessed directly; although the CM intervention raised awareness related to maternal & neonatal health & safe delivery

Abbreviations: ANC = antenatal care; CM = community mobilization; FGC = female genital cutting; FP = family planning; HIV = Human Immunodeficiency Virus; TBA = traditional birth attendant; MWH = maternity waiting home

Despite positive results from use of CM for maternal and child health in SSA, a scoping review of CM for maternal and child health in SSA found that of the 19 studies identified, only 2 defined CM, and 10 studies used the CAC or an adapted version, with no studies reporting on the process of CM itself (Beck et al., 2018). The majority of these studies included small sample sizes, and rarely included comparison groups in their design.

In general, CM interventions for maternal and child health often lack standardization in their definitions, operationalization of the process, and/or reporting of results (Altman et al., 2015). Yet, rigorous CM interventions for maternal and child health that use the CAC have reported promising results. For example, a CM intervention in Malawi employed in tandem with quality improvement initiatives at the facility level indicated that this combined approach resulted in a 22% reduction (OR=0.78, 95% CI 0.60-1.01) in late neonatal mortality, whereas the CM intervention on its own reduced perinatal mortality by 16% (OR 0.84, 95% CI 0.72-0.97), but neither approach influenced maternal death rates (Colbourn et al., 2017). A study in Guinea-Bissau similarly focused on under five deaths as a primary outcome, showing no reduction in under five deaths, but a promising reduction in maternal mortality (their secondary outcome) by 2-4 per 1,000 deaths in the intervention group, compared to 6-15 deaths per 1,000 in the comparison group (risk ratio 0.33, 95% CI 0.14-0.76)(Boone et al., 2016). In addition to individual studies, a meta-analysis of seven randomized controlled trials that took place in Malawi, Bangladesh, Nepal, and India representing 119,428 births in rural settings found that

facilitation of women's groups using CM reduced maternal deaths by 37% (OR 0.66, 95% CI 0.33-0.99) (Prost et al., 2013). This meta-analysis also split their analyses into studies that reported high (>30%) or low (<30%) participation, finding that for studies reporting high participation, maternal death was reduced by 49% (OR 0.77, 95% CI 0.48-1.23) (Prost et al., 2013). Furthermore, the use of CM resulted in increased use of antenatal care and facility delivery in two large randomized trials in LMICs in rural settings, a known factor in the influence of maternal outcomes (Prost et al., 2013).

Measurement Issues Related to CM

Despite use of CM for a variety of maternal and child health issues, in addition to large scale randomized trials evaluating the impact of CM on maternal and neonatal death, a systematic review evaluating studies (n=86) that used CM for sexual, reproductive or maternal health found that 64% (n=55) of studies described or measured CM in some fashion (Altman et al., 2015). However, nonspecific qualitative descriptions in which authors did not describe their methods (n=11) that do not provide measurable outcomes, measurement of programmatic outputs using diffusion or participation indicators (n=22), or community action indicators (n=17) specifying actions taken by participants predominated in the studies reviewed (Altman et al., 2015). Unfortunately, none of these predominating descriptive or measurement choices indicate how the process of CM functions. The remainder of studies (n=11) used linking constructs to explore how the process of CM unfolds. Linking constructs are indicators that measure parts of a process between project input and outputs (Altman et al., 2015).

Linking constructs examined for CM evaluations of sexual, reproductive and maternal health were examined and separated into domains including: collective action, collective agency, collective efficacy, collective identity, perceived similarity, social acceptance/cohesion, and

social networks/support (Altman et al., 2015). The CM studies evaluating linking constructs took scales from previous work around each linking construct's suggested measurement domain, applying it to their CM project (Altman et al., 2015). Each domain was operationalized using scales or single item questions, conceptualized in various ways dependent upon the specifics of each study. For example, the domain of social networks/social support was operationalized by six studies in six different ways, ranging from a single item scale, "Friends suggest ways of avoiding unsafe sex," to a seven-item yes/no questionnaire listing various community organizations in order to identify access to and participation in social and community networks (Kegeles, Hays, & Coates, 1999; Lippman, Shade, & Hubbard, 2010). To date, there exists only one study (focused on the reduction of HIV transmission among young people in South Africa) that conducted qualitative inquiry to provide content validity for a site specific list of linking constructs and measurement domains, before measuring all CM domains holistically (Lippman, Maman, Macphail, Twine, & Peacock, 2013; Pettifor et al., 2015).

This paucity of data and lack of standardized measurement and reporting on the process of CM has skeptics critical of scaling up or expanding CM strategies despite statistical evidence that these approaches are effective. Some argue that the scientific community has enough information to scale up CM approaches, reducing the burden of maternal and child mortality in LMICs, or suggest that we have the evidence needed to conduct large scale effectiveness studies using CM for the prevention of maternal and child death (Victora & Barros, 2013). Despite progress towards understanding how the process of CM works through use of linking constructs, the lack of standardization and variation in reporting and measurement continues to hinder the expansion of this high impact strategy. Additional refinement of measurement scales to create concise scales evaluating CM domains are needed to help elucidate how these strategies work.

Further use of refined scales in CM studies will help provide evidence as to how CM functions as a strategy, advancing the science.

Chapter 3 Methods

This secondary analysis will use longitudinal data from a parent study investigating the impact of maternity waiting homes (MWHs) and will employ a concurrent mixed methods design to examine eight proposed domains of community mobilization (CM) and their potential change over three years among rural Zambians living in 10 communities in Mansa and Lundazi districts with recently constructed maternity waiting homes (MWHs), known as Zambian Mother's Shelters (ZaMS). This will be achieved in part by comparing data from ZaMS sites to comparison sites, or clinics that did not have adjacent ZaMS. The dataset from the parent study is one of the few available to

Figure 5. Zambian Mother's Shelter (ZaMS)

ɛsted domains of CM using a large scale, cross-sectional CM intervention (Lori, Munro-Kramer, Mdluli, Gertrude, & Boyd, 2016; Scott et al., 2018). This secondary analysis was deemed exempt and not regulated by the University of Michigan IRB (HUM00165339). The dataset for these analyses come from an evaluation of MWHs which began in May 2015 and concluded in July 2018 in partnership between researchers at the University of Michigan School of Nursing and Africare-Zambia. The parent study focused on health system strengthening and increasing facility delivery for women living the farthest from care using a package of interventions, including CM. Using a two-group comparison design, the parent study evaluated maternal outcomes at 10 rural health facilities with ZaMS adjacent and 10

rural health facilities without ZaMS in the Mansa and Lundazi districts. The interventions at the ZaMS sites focus on strengthening referral networks from the rural health facilities to the district level facilities.

Setting: The parent study was conducted in Zambia, a land-locked country in sub-Saharan Africa. The two districts in the study were Mansa and Lundazi, these districts were included due to their prior identification as Saving Mothers Giving Life (SGML) districts (Scott et al., 2018). Three overarching strategies were used in the SGML intervention, creating legacy districts where: 1) community leaders/volunteers known as Safe Motherhood Action Group (SMAG) members were trained in providing accurate messaging and support to pregnant women, 2) transport, communication systems, and infrastructural issues were addressed to increase availability and access to healthcare, and 3) health facilities were supported in building capacity to safely manage obstetric complications in accordance with high quality care (Conlon, et al., 2019).

Figure 6. Zambia on African continent

Mansa is a rural fishing community that represents the provincial capital within Zambia's Luapula province. Mansa was named for the local chief, Mansa, and is geographically aligned along the Mansa and Luapula rivers in northwestern Zambia along the border with Congo (Gewald, Hinfelaar, & Macola, 2005). There are eight main ethnic groups in Mansa district, although the majority of people speak a common language, Bemba, and live in rural areas (Gewald et al., 2005). Ten sites in Mansa were

Figure 7. SGML locations, Zambia (Central Statistical Office, Zambia, 2017)

identified by the Ministry of Health and parent study's implementing partners Africare Zambia, and jointly determined to be included in the study.

Site selection for communities where ZaMS were constructed included six main characteristics to be considered for the intervention. This encompassed: 1) linkage to a basic emergency obstetric and newborn care (BEmONC) or comprehensive emergency obstetric and newborn care (CEmONC) facility that had at least 150 annual deliveries, 2) sites had to be within a maximum of two hours to a CEmONC, 3) had to meet minimum standards of care and quality in terms of infrastructure and services rendered, 4) site linkage to income generating activities (IGAs) that would encourage sustainability by supporting operating and maintenance needs, 5) each site required local democratic governance by locally elected ZaMS committees that would provide support and oversight to ZaMS caretakers and site coordinators, and 6) sites had to demonstrate responsiveness to the needs of women and the local community (Kaiser et al., 2019; Lori et al., 2019; Scottet al., 2018). Villages in the catchment of each site participated in the construction of the ZaMS; making bricks and bringing them to the site of the future ZaMS, donating sand, cement, or labor (Lori et al., 2019). In addition, some communities had available structures adjacent or nearby the ZaMS that were available for use to implement income generating activities, such as the hammer mill (Lori et al., 2019).

The five intervention (ZaMS) sites in Mansa included Lubende, Mano, Fimpulu, Mutiti, and Lukola. The clinics at each of these sites served a number of villages in their catchment areas, which varied. In the second year of the parent study, some villages were redistributed to health posts and no longer considered part of the catchment area for the ZaMS or comparison sites, yet women still traveled from these sites to use the ZaMS. The Lukola clinic, adjacent ZaMS, and villages in their catchment area were near the border with the Democratic Republic

of Congo, accessible via crossing a small bridge and may have introduced some non-Zambians into the sample thereby not receiving the full CM intervention. The health clinic and ZaMS site at Mano experienced a high turnover in health facility staff and hammer mill operators. People traveled from varying distances to reach clinics for antenatal care and birth: on foot, bicycle, motorbike, oxcart, or rarely, by vehicle (Africare Zambia, personal communication, 2018). The five ZaMS (intervention) sites were matched with five comparison sites based on distance from CEmONC, kilometers and time in minutes to from a CEmONC facility, delivery volume, number of women of reproductive age, and absence of a functional MWH (Lori et al., 2019). See Table 2 for a complete depiction of the population density and distance to BeMONC from the ZaMS and their matched comparison sites.

Table 2. Intervention (ZaMS) and Comparison (non ZaMS) sites in Mansa, Zambia (Lori et al., 2019)

BeMONC sites with ZaMS	Population	Distance in Km (minutes from BeMONC)	BEmONC sites with no ZaMS (matched comparison sites)	Population	Distance in Km (Minutes from BeMONC)
Lubende	4,192	44(40)	Musaila	2,868	0.88(55)
Mano	6,619	46(40)	Kundamfumu	6,600	45(30)
Fimpulu	5,597	32(25)	Kabunda	5,075	15(15)
Mutiti	6,776	60(45)	Mibenge	7,722	58(50)
Lukola	5,957	12(25)	M'wanguni	7,722	12(15)

Staff at the ZaMS and comparison sites generally included a midwife who lived in a home adjacent to the clinic with support from nurses, environmental health technicians and volunteer health workers known as SMAGs trained as a part of the SGML intervention. The ZaMS sites also included a ZaMS caretaker, a ZaMS governance committee including a treasurer, secretary,

president and vice president- all locally elected to manage the ZaMS and ensure standardization of each site's facilities, upkeep, and community buy in (Lori et al., 2019).

Lundazi is located in the Eastern province along the border of Malawi. Lundazi district is a mountainous agricultural district, with 95% of inhabitants living in rural areas (CSO Zambia, 2014). There are five main ethnic groups in Lundazi district, although people communicate using the common languages Tumbuka or Njanga (Africare Zambia, personal communication, May 12, 2018). The five intervention (ZaMS) sites in Lundazi were chosen with the same criteria used in Mansa, with five comparison matched (non-ZaMS) sites. The clinic and ZaMS at Nyangwe were a short distance from the border with Malawi, and were used by women from Malawi who were not necessarily able to benefit from the full CM intervention. Similar to the case in Mansa, some villages were reassigned to health posts where they were encouraged to obtain antenatal and obstetric/midwifery care during the second or third year of the parent study. Some of these inhabitants continued to come to use the ZaMS or comparison sites, and generally traveled further distances to do so. The Lusuntha ZaMS and clinic site obtained power/electricity from Malawi and experienced frequent black outs, impacting both the clinic as well as the income generating electricity powered hammer mill. Some ZaMS sites in Lundazi used a sunflower seed press powered by diesel (making oil for the ZaMS occupants and to sell) as their main income generating activity rather than a hammer mill. See Table 3 for a complete depiction of the matched intervention and comparison sites in Lundazi.

Figure 8. Sunflower seed press at Nyangwe, Zambia

Table 3 . Intervention (ZaMS) and Comparison (non ZaMS) sites in Lundazi, Zambia (Lori et al., 2019)

BeMONC sites with ZaMS	Population	Distance in Km (minutes from BeMONC)	BEmONC sites with no ZaMS (matched comparison sites)	Population	Distance in Km (Minutes from BeMONC)
Mwase Lundazi	19,578	31(25)	Kapichila	10,287	27(30)
Nkhanga	11,913	40(50)	Kamsaro	5,701	24(40)
Nyangwe	6,407	55(60)	Lukwizizi	4,463	35(50)
Lusuntha	10,323	16(10)	Phikamalaza	6,051	16(20)
Zumwanda	6,670	30(30)	Chikomeni	7,475	35(30)

***CM activities**:* The CM process employed at the ZaMS sites focused on implementing strategies that would elevate demand generation strategies to increase use of ZaMS and their associated health facilities. Villages that were ten kilometers or greater from the health facilities/ZaMS were prioritized for sensitization and CM, led by SMAG members, who focused on the encouragement of pregnancy and birth registration, birth preparedness, and provided information about the ZaMS. As a part of the CM process, SMAG members received training from the Ministry of Health on the best way to conduct community meetings, which they held monthly in villages in their catchment and/or at the health facilities to discuss healthy pregnancy and birth. District Health offices provided support through meetings with traditional leaders, where headmen were encouraged to support the work of the SMAG members. Out of these meetings also emerged the decision that headmen planned to institute punitive measures for women who birthed at home, in the form of fines. Headmen met

Figure 9. Income generating hammer mill at ZaMS site, Mansa

monthly to discuss how things were going in relation to facility birth and male involvement with reproductive health services in their communities. In addition, each ZaMS site formed governance committees that were democratically elected at each site to include a treasurer, secretary, president, and vice president. These groups met monthly and implemented various income generating strategies to diversify their income generation and work toward sustainability of the ZaMS. The ZaMS each had one main adjacent income generating system, suggested by the local community. Diesel and solar powered hammer mills were the main source of income at sites in Mansa and Lundazi. Some sites in Lundazi chose a sunflower seed press, harvesting the oil. The hammer mills were used to grind corn into a flour then cooked into the main staple, called nshima. Some of this food was kept at the ZaMS to feed pregnant women, and the remainder was sold for profit to support the ZaMS. Funds were used to provide food to pregnant women, buy soap, mosquito nets, laundry soap, cleaning materials, and other essentials to keep in the ZaMS for women, to pay the ZaMS caretaker, pay the hammer mill operator, to maintain the quality of the ZaMS infrastructure, and the implementation of keyhole gardens adjacent to ZaMS to feed pregnant women and their relatives. Diversification was beginning to emerge at year three (endline) and varied across sites but included the purchasing of pigs, rabbits, chickens, and farming various crops, including Moringa.

Figure 10. Vegetable garden adjacent to ZaMS; Mansa

Measures: The parent study contained pre-post individual survey data systematically collected using a 19-item questionnaire. The survey focused on six domains relevant to community mobilization as well as two suggested individual domains, from rural Zambians

living in the ZaMS and comparison communities (See Tables 4, 5 & 6). For the purposes of this analysis, the 19-items used for this study will be referred to as the CM survey. The CM survey uses a dichotomous yes/no response for each item. The CM survey data were collected from three groups at each site at baseline and endline of the parent intervention: 1) women with babies <1 (baseline), women with babies <2 (endline), 2) health workers, and 3) community members (See Table 4).

Table 4. Populations sampled at baseline and endline

Population Sampled	Baseline Individual surveys	Endline Individual surveys	Baseline Focus Groups	Endline Focus Groups
Women with babies <1 year	X		X	
Healthworkers	X	X	X	X
Community Members	X	X	X	X
Women with babies <2 years		X		X

Characteristics of the population sampled were collected as categorical (highest level of formal education; marital status; group - women with babies, community members, health workers) and continuous (age, years lived in the community, number of living children) variables. The variable concerning level of education was collapsed to include three categories (none, some/completed primary, some or completed secondary or tertiary), marital status was dichotomized to married/unmarried.

The parent study dataset also contains focus group data from 76 separate focus groups conducted in all of the ZaMS and comparison communities placing participants' voices at the forefront of the CM domain evaluation. Focus groups at baseline and endline were conducted with the same three groups at each site: 1) women with babies <1 (baseline), women with babies

<2 (endline), 2) health workers, and 3) community members, immediately following CM survey completion. See Table 4 for a complete depiction of the population sampled for the focus groups and CM surveys. The focus group's semi-structured questions were aimed at evaluating the impact of CM and the ZaMS on the ability of pregnant women to seek healthcare. The focus group semi-structured questions included the following domains: 1) collective action, 2) governance, 3) social acceptance/cohesion, and 4) social support/networks. See Table 5 for a complete depiction of the domains targeted in CM survey and focus groups, including the CM survey items, focus group questions and their origin. Refer to Appendix A-1 for a copy of the CM survey and Appendix A-2 for a copy of the focus group questions and guide.

Table 5. CM domain information collected via CM survey and focus groups

CM Domain	Definition	Operationalization	Adapted from
Collective action	Depth, breadth, and quantity of activities in the village aimed toward social change Lippman et al. 2016	Focus groups only: • In the past 6 months, have you participated in a meeting or gathering around pregnancy, childbirth, or newborn care? (focus group only) • Have you ever been involved in organizing a meeting or gathering to provide information to your community? (focus group only) • What types of groups or meetings would you like to see in your community?	Lippman et al. 2016
Collective efficacy	Do community members intervene on behalf of the common good? (Lippman et al., 2016)	• I believe that a community can hold group meetings to talk about issues that involve them. • I believe that a community can work with current community groups to deal with issues that involve them. • I believe that a community can have a say in changing the conditions that involve their lives.	Romero et al. (2006); Sood (1999)
Governance	Control over group decisions, success in achieving goals	• I can influence the decisions that this group makes. • This group is successful in achieving its goals. • I am satisfied with the amount of change I have over decisions that this group makes. • My community has influence over the choices that involve my life. Focus group: • Tell me about other groups or important community members that influence decisions that involve the community.	Romero et al. (2006); Israel et al. (1994)
Perceived control	Satisfaction with control over group decisions	• This group has control over decisions that involve my life • I can control decisions that involve my community.	Romero et al. (2006); Israel et al. (1994)

		• I feel good with the amount of control I have over decisions that involve my community.	
Social acceptance/social cohesion	Community connectedness and working trust (Lippman et al., 2016)	• I think my community is a good place to live. Focus group: 1) Who do you go to for answers, guidance, and advice if you have a problem or question about pregnancy, childbirth or newborns?	Romero et al. (2006); Prestby et al., (1990)
Social support/networks	Perception of mutual aid, trust, and support (Lippman et al., 2010)	Focus group only: • Tell me about your community? • What do you like most about living in your community? • What would you like to see change? • Do you feel supported by your community? • Can you count on people in your community if you need to borrow money? • Can you count on your community to help if you need to go to the doctor or hospital?	Sense of Community: Romero et al (2006); Prestby et al., 1990)
Self-efficacy	Cognitive domain of psychological empowerment	• I am often a leader in groups. • I can usually organize people to get things done. • I find it very easy to talk in front of a group.	(Romero et al (2006); Zimmerman & Zahniser(1991)
Power in relationships	Reflection of gender dynamics to situate occurrence of change processes	• Using a condom every time I have sex would make my partner angry. • Using a condom every time I have sex would make my partner think I don't trust them. • Using a condom every time with my partner would make my partner not trust me.	(previously unvalidated, used in Romero et al 2006)

The key community-focused constructs explored in this study are: 1) collective action, 2) collective efficacy, 3) governance, 4) perceived control, 5) social acceptance/cohesion, and 6) social support/networks. The key individually focused constructs used in this analysis are: 1) self-efficacy and 2) power in relationships. The constructs were explored through individual survey data using the CM survey (collective efficacy, perceived control, governance, self-efficacy, power in relationships), focus groups (collective action, social support/networks), or a combination of individual survey and focus group questions (governance, social acceptance/cohesion). See Table 6 for a depiction of which domains were investigated in the focus groups and the CM survey, or both.

Table 6. CM domain items investigated in CM survey and focus groups

CM Domain	CM Survey	Focus Group
Collective Action		3 questions
Collective Efficacy	3 questions	
Governance	3 questions	1 question
Perceived control	3 questions	
Social acceptance/ Social cohesion	1 question	1 question
Social support/networks		6 questions
Self-efficacy	3 questions	
Power in relationships	3 questions	

CM Survey Domains

Community Focused Constructs

Collective action. The items for this construct, developed through focus groups and cognitive interviewing and later tested using exploratory factor analysis in rural South Africa to explore the, "presence, breadth, and quantity of activities aimed at social change," (Lippman, Maman, Macphail, Twine, & Peacock, 2013, p. 129; Lippman et al., 2016). The items concerning this construct were originally developed to understand the impact of CM as a preventative intervention for use in rural villages in South Africa experiencing a high prevalence of HIV (Lippman et al., 2013) and were then adapted for the parent study. Similar adapted items have also been used in an evaluation of reproductive and maternal health programs in Malawi (Sebert Kuhlmann et al., 2017). The published literature provides evidence of the responsiveness, feasibility, content, and convergent validity when used in survey form (Lippman et al., 2013; Lippman et al., 2016; Sebert-Kuhlmann et al., 2017). Three items were adapted from Lippman et al.'s (2013, 2016) and Sebert Khulmann et al.,'s (2017) work to address collective action in the parent study, structured as open-ended questions in focus groups such as, "In the past six months, have you participated in a meeting or gathering around pregnancy, childbirth, or newborn care? Have you ever been involved in organizing a meeting or gathering to provide information to your community? What types of groups or meetings would you like to see in your community?"

Collective efficacy. This construct is illustrated as an important item in the mechanism of action for interventions using CM, where it explores whether community members act on behalf of the common good (Lippman et al., 2016). The items included to measure this construct originally stem from a dissertation exploring the impact of a radio soap opera in India on the initiation of social change behaviors (such as use of modern family planning) and were later

adapted for use in an HIV prevention intervention for women using family planning clinics in rural and urban New Mexico (Romero, Wallerstein, Lucero, Fredine, & Module, 2006; Sood, 1999). The collective efficacy scale is a three-item scale adapted from Romero et al's (1999) six-item scale by the CM study team. Items were scored as dichotomous variables (i.e.0=no, 1=yes). Higher scores on the scale represent increased collective efficacy and it takes less than one minute to complete. This measure has been tested in India and in the United States (Romero et al., 2006; Sood, 1999). Psychometrics from prior analysis showed $\alpha = 0.92$ (Romero et al., 2006; six item scale) compared with Sood (1999); $\alpha = 0.85$ (12 item scale).

Governance. The construct of governance explores influence or control over group decisions and success in achieving goals (Israel, Checkoway, Schulz, & Zimmerman, 1994; Romero et al., 2006; Schulz, Israel, Zimmerman, & Checkoway, 1995). The items included to measure governance on the CM survey were borrowed from a study where they were developed for use in an urban community with people of all genders (Schulz et al., 1995). The items were later adapted for use in urban and rural New Mexico in an HIV prevention intervention for women using family planning clinics, where they were identified as measuring governance (Romero et al, 2006). The governance scale was adapted for use by the CM study team to include four questions on the individual survey, and one question for the focus groups semi-structured interview. The open ended item included in the focus groups asked, "Tell me about other groups or community members that influence decisions that involve the community." Items were scored as dichotomous variables (i.e.0=no, 1=yes). Higher scores on the scale indicates increased governance. The items on this scale have been psychometrically tested among United States based populations (Israel, Checkoway, Schulz, & Zimmerman, 1994; Romero et al., 2006; Schulz, Israel, Zimmerman, & Checkoway, 1995). Psychometrics from

prior analysis showed $\alpha = 0.59$ (Romero et al., 2006) compared with Israel et al. (1994); $\alpha = 0.61$.

Perceived control. Perceived control is a construct that focuses on satisfaction with and control over group decisions, going beyond participation (Schulz et al., 1995, Romero et al., 2006). Items adapted for the CM individual survey were originally created using a large sociological survey in an urban city in Michigan with people of all genders, and later adapted in an HIV prevention intervention for women using family planning clinics in urban and rural New Mexico (Romero et al., 2006; Israel et al., 1994). The CM study team adapted three items on the perceived control scale for use in their survey in rural Zambia. Items are scored as dichotomous variables (i.e.,0=no, 1=yes). Higher scores on the scale represent increased perceived control. Items on this scale have been psychometrically tested in the United States (Schulz et al., 1995, Romero et al., 2006). Psychometrics from prior analysis showed $\alpha = 0.73$ (Romero et al., 2006) compared with Israel et al., 1994; $\alpha = 0.63$.

Social acceptance/cohesion. The construct of social acceptance/cohesion relates to community connectedness and working trust (Lippman et al., 2013). The item adapted for the CM individual survey was originally used in research examining participation in the context of the social and physical environment in relation to crime and neighborhood groups in New York city (Perkins, Florin, & Rich, 1990). The scale was adapted by Romero et al.,(2006). Items were also adapted for use in a reproductive and maternal health intervention in Malawi (Sebert Kuhlmann et al., 2017). Items are scored as dichotomous variables with (i.e., 0=no, 1=yes), with higher scores on the scale representing increased social acceptance/cohesion. The CM study team adapted one item for use in the CM survey, " I think my community is a good place to live," with $\alpha = 0.77$ (Romero et al., 2006). One item was included in the focus groups, "Who do

you go to for answers, guidance, and advice if you have a problem or question about pregnancy, childbirth or newborns?" adapted from Lippman et al. (2013).

Previously published literature provides evidence of the collective efficacy (Lippman et al., 2016; Romero et al., 2006; Sood, 1999), governance (Israel, et al., 1994; Romero et al., 2006), perceived control (Romero et al., 2006; Israel et al., 1994), and social acceptance/cohesion (Perkins et al., 1990; Romero et al., 2006; Prestby, Wandersman, Florin, Rich, & Chavis, 1990; Sebert-Kuhlmann et al., 2017) scale's responsiveness, feasibility, structural, content, and convergent validity. Responsiveness was tested using paired t-tests in Romero et al.'s (2006) study in New Mexico and showed significance in all four of the items tested at $p < 0.05$.

Individual Focused Constructs

Power in relationships. The power in relationships scale is a three-item scale measuring power in intimate dyadic relationships (Romero et al., 2006). Use of the power in relationships domain has also been employed as a way to evaluate gender dynamics to situate the occurrence of change processes in CM interventions (Sebert-Kuhlmann, et al., 2017). The questions used in the parent study asked about negotiation of condom use with partners, a tactic used repeatedly across the literature used to understand individual's perceptions of their ability to control behaviors, and sometimes used as a proxy to measure self-efficacy (Albarracin, Kumkale, & Johnson, 2004). The original survey items were developed in urban and rural New Mexico in an HIV prevention intervention aimed at women using family planning clinics (Romero et al., 2006). The CM study team chose all three items for their CM individual survey data collection. Items are scored as dichotomous variables with (i.e., 0=no, 1=yes), with higher scores on the

scale representing decreased power in relationships and it takes less than one minute to complete. Psychometrics from prior analysis showed $\alpha = 0.85$ (Romero et al., 2006).

Self-efficacy. The self-efficacy scale is a three-item scale assessing self-efficacy as a proxy for the interpersonal level of perceived control relating to sociopolitical spheres of control, referring to beliefs about ones abilities in influencing social or political systems (Romero et al., 2006; Zimmerman & Zahisner, 1991). Social and political systems in this context may refer to anything from influencing policy, to organizing neighborhood groups, or leading a small group of people (Romero et al., 2006; Zimmerman & Zahisner, 1991). The original items were developed across three separate studies measuring sociopolitical control including questions derived from a self-efficacy scale. These items were first tested on undergraduate students in the United States and cross validated using community members and later church members (Zimmerman & Zahniser, 1991). Romero et al. (2006) then adapted the items for use in their HIV prevention intervention in New Mexico with women using family planning clinics in urban and rural areas. The CM study team used the three statements survey developed by Romero et al.,(2006) for the CM survey. Items are scored as dichotomous variables with (i.e., 0 = no, 1=yes). Higher scores on the scale represent increased self-report of self-efficacy. This measure has only had psychometric testing in United States based populations. Psychometrics showed $\alpha = 0.78$ (Romero et al., 2006) compared with Zimmerman and Zahisner (1991); $\alpha = 0.78$ (17 item scale).

The published literature provides evidence of the responsiveness, feasibility, structural, content and convergent validity of the self-efficacy (Romero et al., 2006; Zimmerman & Zahisner, 1991) and power in relationships (Romero et al., 2006; Sebert-Kuhlmann, et al., 2017)

items used in the CM survey. Please see Appendix A for a copy of the CM survey and focus group questions.

All data were collected by Africare-Zambia collaborators in a standardized fashion according to pre-determined and agreed upon protocols. All data collectors were trained in the ethical conduct of research and research compliance, fluent in the local language, and familiar with local customs. Individual interviews were translated into the local language appropriate to the site and read to participants in order to include those who were unable to read. Participants were instructed to mark in the box for Yes or No as each question was read, and some participants required assistance from research assistants to fill in the survey. Surveys were then collected and responses entered into excel by graduate research assistants. Focus groups were recorded in the local language, translated into English, and back translated to ensure accuracy of translation. As a part of the parent study, the collection of the individual survey and focus group data was approved by the University of Michigan IRB (HUM00110404) and the ERES Converge Research Committee in Zambia.

Sampling

Participants were recruited via convenience sampling, wherein each village in the catchment area was notified by the local health facility and local leaders by word of mouth of the opportunity to participate in research and provided with the date and time to arrive at the health facility if they were interested and eligible to participate. Research participants were eligible if they were from one of three groups: 1) women with babies (<1 years of age at baseline and <2 years of age at endline), 2) community members, or 3) health workers. Refer to Table 4 for a depiction of groups sampled and data collected at baseline and endline.

Inclusion and Exclusion Criteria

Inclusion criteria for each group included the following:

(1) Women with babies: The women with babies group included mothers over the age of 15 years old. Mothers under the age of 18 years old who become 'parent-children' in Zambia are considered emancipated under the law and do not require parental consent for inclusion in research (Santelli, Haerizadeh, & Mcgovern, 2017).

(2) Community members: Men or women who lived in the community for at least one year and were over the age of 18 years old.

(3) Health workers: Health workers included Safe Motherhood Action Group members, community health workers, or environmental health technicians that were age 18 years old or older.

Exclusion criteria for all groups included people who were visiting the health center on the day of research activities and were ill requiring treatment.

Data Collection

To begin, interested participants were given a brief description of the study in the local language (Tumbuka, Bemba, or Nyanja) by the Africare-Zambia research staff. Individuals interested in participation then read through the consent forms or had the forms read to them in a private location where they were given the opportunity and encouraged to ask questions. Informed consent and interview questions were provided in English, Tumbuka, Bemba, and Nyanja. Africare-Zambia staff that spoke English and the local language conducted both the informed consent as well as assisted with the individual interview for illiterate participants and led the focus groups. Those interested in participating then signed the consent, or affirmed consent through use of a single finger print using an ink pad. Participants then completed the

individual survey on their own (unless illiterate then were assisted by research assistant) before participating in the focus groups. Focus groups were conducted in private areas in the clinic with 9-17 people, taking an average of 45 minutes to complete. Participants were provided with a snack and beverage as compensation for their time.

Analysis by Aim

Aim 1 and Sub-Aim1 will be achieved in tandem with one another, beginning with Sub-Aim1, an examination of the factor structure of the CM survey. Aim 1 will therefore be described in the methods following a description of Sub-Aim 1.

Sub-Aim1. Examine the factor structure (i.e., latent constructs) of the CM survey among rural Zambians using baseline and endline data.

This aim used exploratory factor analysis to identify the latent constructs within the CM survey. Factor analysis is used for psychometric evaluations of instruments, construct validation, and data reduction; with each of these concepts ultimately emerging from the common factor model (Brown, 2006). Thurstone's (1947) common factor model suggests that individual variables within a grouping of observed measures is a linear function of one or more common factors and one unique factor (Matsunaga, 2009). Factor analysis separates the variance of each variable from the correlation matrix into two parts: common and unique variance (Brown, 2006; Matsunaga, 2009). Common variance is the variance that is accounted for based on the estimate of variance that is shared among other variables in the model, representing the variance of the latent factor (Brown, 2006; Matsunaga, 2009). Unique variance accounts for random variance and the variance that is caused by the variable itself (Brown, 2006; Matsunaga, 2009).

Exploratory factor analysis (EFA) is a theory building analysis that is used to examine little known constructs to identify latent factors that underlie variables as well as relationships

between latent and observable variables (Lloret, Ferreres, & Tomás, 2017). We chose to use EFA for this analysis as little is known about how and why CM functions, and EFA will allow us to identify the latent factors underlying responses to the CM survey, creating a more parsimonious tool for use in this rural Zambian context. Analyses for the EFA were conducted in SPSS (v. 26). To begin, data were cleaned, labeled and descriptive analyses were conducted to assess for missingness, influential outliers, and inconsistent response patterns. Only data considered complete (collected at both baseline and endline) was used in the final analyses. The dichotomous survey data were checked for normality by reviewing the means and standard deviation and mean, range, standard deviation. Medians of the continuous descriptive data were also reviewed for error or outliers. To account for missing data, listwise deletion was used. All p-values were set at 0.05. Sample size recommendations for factor analysis include a minimum of 300 cases (Tabachnick & Fidell, 2007) or 10 cases per item in the instrument (19 items x 10 = 190) (Nunnally & Bernstein, 1994). We further examined sampling adequacy using the Kaiser-Meyer-Olkin (KMO) and Bartlett test (Tabachnick & Fidell, 2007). The KMO test holistically evaluates all factors influencing adequacy including sample size, correlation between variables, and the number of variables per factor (Lloret et al., 2017). The standard cutoff for an adequate sample using KMO include results between 0.70 and 0.80 and will be used for this analysis (Lloret et al., 2017). Baseline, endline, and combined sample (baseline and endline) samples were explored separately using orthogonal (varimax) and oblique (oblimin) rotation for each sample's EFA to find the best factor solution.

The analyses were approached in a step-wise fashion, with consideration to the subjectivity inherent in the methodological choices that must be made in conducting an EFA. In general, EFA has four main steps: 1) determining the number of factors and correlations among

data items, 2) identifying items/variables that load onto particular factors, 3) exploring items/variables that do not load anywhere and may require removal, and 4) exploring meaning of the factors identified (Matsunaga, 2009). To conduct the analyses, the SPSS extraction method was set to principal axis to highlight the common variance among variables and indicate the latent factors within the data (Matsunaga, 2009). Upon completion of the EFA, the number of factors to be retained was decided, the total number of possible factors represented by the total number of variables analyzed, and only theoretically meaningful factors retained (Matsunaga, 2009).

Use of more than one method to determine factor extraction increases accuracy, as some of these methods are criticized for over-extraction (Kaiser-Guttman, scree test), or susceptibility to sample size (Bartlett's) (Matsunaga, 2009). Our criteria for factor extraction included Bartlett's test of sphericity (which relies on chi-square significance), scree test, Kaiser-Guttman criteria (retain only eigen values >1) and item factor loading >0.5. Bartlett's test of sphericity suggests values > 0.05 indicate variables are related enough that detecting a latent structure will be possible, making a factor analysis useful with the dataset. Structural validity was assessed by examining factor loading in relation to theoretical domains. We tested for internal consistency reliability using Cronbach's alpha to verify whether the items were related and measuring the same construct, with 0.70 set as an acceptable score. The factors resulting from Sub-Aim 1 were then used to conduct analyses in Aim 1.

Aim 1. Examine the change in domains of CM among a sample of rural Zambians from three groups (women with babies, community members, health workers) within 10 communities surrounding the ZaMS using both baseline (n=646) and endline data (n=654).

The refined CM constructs found in the factor analysis were analyzed for changes over time in the baseline and endline CM survey data using a multivariable descriptive model. Multivariable linear regression is used to understand the relationship between a continuous dependent variable and multiple independent variables, which allows researchers to analyze data collected outside a laboratory setting (Tabachnick & Fidell, 2007). Multivariable ordinary least squares (OLS) regression can be used to fit a line to bivariate data to minimize the squared vertical distance between each data point to the line (Sokal & Rohlf, 2012). The slope of the OLS changes in relation to the covariance between x and y or any change that arises in the variance of the x-axis variable (Sokal & Rohlf, 2012).

All multivariable analyses were conducted in Stata (v. 16). Prior to analyses all assumptions were verified including normality, linearity and homoscedasticity (Tabachnick & Fidell, 2007). To account for missing data, listwise deletion was used due to the small amount of missingness at random with adequate power with cases with missing data removed. Sample size recommendations for multivariable regression models recommends using $N \geq 50 + 8m$, with m representing the number of independent variables (Green, 1991). All p-values were set at 0.05. Crosstabs were used to assess the collapsed variables for completeness with the original variables in the dataset.

We tabulated the number of yes/no answers for each item on the revised (post factor analysis) survey to create a score for each factor. This was done for the baseline and endline surveys separately. This score was then used to compare means over time. Between group comparison was conducted to assess the impact of CM on the different groups (women with babies, health workers, community members) in relation to demographic information such as age, level of formal education, and years lived in the community. Bivariate descriptive analyses

were conducted to examine responses on the final survey with each sub-group (women with babies, health workers, community members) between intervention and comparison communities at baseline and endline, as well as among intervention sites and comparison sites at the two timepoints. See Tables 2 and 3 for a depiction of ZaMS and comparison sites in Mansa and Lundazi. Categorical variables were analyzed using chi-square, to compare proportions. Continuous variables were analyzed to compare means using independent t-tests, with Mann Whitney U tests used in the case of skewed data.

We then created four separate multivariable regression models for each factor, controlling for independent variables including: 1) pre- and post-intervention (time); 2) intervention vs comparison site; 3) group (women with babies, community members, health workers); and 4) demographic variables such as years lived in the community, age, marital status, number of living children, and level of formal education. Finally, we checked for interaction effects between time (representing baseline to endline timepoints) and groups (women with babies, community members, health workers) for each of the factors.

Aim 2. Identify how constructs of CM influence women's care seeking behaviors for themselves during pregnancy and childbirth (n=76 focus groups with 1,203 participants).

Focus group data from ZaMS and comparison sites in both districts were reviewed using content analysis methodology to identify how constructs of CM influence women's care seeking behaviors during pregnancy and childbirth using the CM Theory of Change (ToC) framework (See Figure 1) to guide analysis. All analyses were conducted in Dedoose (v, 8.3). Content analysis was first used as a quantitative analytic method to explore the explicit meaning behind communication, but has since evolved (Berelson, 1952). As a qualitative analytic method, content analysis has transformed, engaging with implicit and explicit meaning found in various

forms of communication (Graneheim & Lundman, 2004). This method uses a systematic approach to the subjective interpretation of textual data through a rigorous process of identifying themes and/or patterns and coding them for analysis (Cho & Lee, 2014).

The CM focus group data were analyzed using a deductive approach, with CM domains as a priori themes. The CM domains were included as a priori themes which the parent study specifically included targeted focus group questions. This included the four community focused domains of: 1) collective action, 2) governance, 3) social acceptance/cohesion, and 4) social support/networks (Altman et al., 2015) . The community focused CM domains of collective efficacy and perceived control were not specifically targeted by focus group questions, nor were the individually focused domains of self-efficacy or power in relationships, and therefore were not included as a priori themes.

Content analysis allows for inductive or deductive approaches (Cho & Lee, 2014). Inductive approaches are used when knowledge about the topic is limited or disunited, whereas deductive approaches are useful when the analysis can be structured based on known elements (Elo & Kyngas, 2008). The deductive approach suits our data as the data collection process aimed to gather information about specific CM domains. The concise nature of focus group interview data from our rural Zambian participants additionally lends itself to the deductive approach.

Content analysis allows for the exploration of manifest and latent text, guided by specific research questions generated by the research team (Schreier, 2012). Using an unconstrained categorization matrix allowed us to guide our analysis with a focus on the CM domains, while also permitting the emergence of latent themes from the data and maintaining trustworthiness of the analysis process (Elo & Kyngas, 2008). We referred to tables that we made as well as output

from our software (Dedoose v, 8.3) analyses to connect the raw data to the evaluation and results to increase the reliability of the study and trustworthiness of our data (Elo & Kyngas, 2008; Sandelowski & Barroso, 2003). The aim and research questions provided guidance for our unit of analysis as we evaluated the manifest and latent content (Elo & Kyngas, 2008). The evaluation research question guiding our qualitative analysis included:

- What are the specific components of community engagement that produce change in care-seeking behaviors?

According to Polit & Beck (2004) researchers must become immersed in the data to gain complete familiarity with the content prior to analysis, which requires reading through the text several times. Our research team began the analysis by reading all of the transcripts from women with babies and health-workers to begin to make sense of the whole, become familiar with, and contextualize our data (Elo & Kyngas, 2008). The systematic steps for content analysis identified by Elo & Kyngas (2008) then structured the steps of our analysis in the following manner: 1) developed an unconstrained categorization matrix based on the CM domains, 2) re-read transcripts to capture general content and coded for identified categories and latent information within the text, 3) next conducted an in depth re-reading to identify and label general codes, 4) followed by a continued review of transcripts until data saturation was reached, 5) reviewed codes with mentors (Drs. Lori & Munro-Kramer) to reach consensus on coding, and 6) finally, the codes were assimilated into the investigator derived CM ToC framework created for the CM intervention in rural Zambia (Figure 1). As an iterative process, the labeling, coding, and categorizing process continued until consensus was reached.

Aim 3. Describe the process that engages and mobilizes communities in rural Zambia toward improved maternal health outcomes using a concurrent mixed methods approach (n=76 focus groups with 1,203 participants; N=1,300 CM survey participants).

The results from Aims 1 & 2 will be merged using a concurrent mixed methods approach to provide a better understanding of the components of CM that enable change in care seeking behaviors for pregnant or laboring women (Creswell et al., 2014). Mixed methods approaches are useful when evaluating constructs that are difficult to measure or multifaceted phenomena, enabling researchers to explore an area more comprehensively and/or evaluate processes (Creswell et al., 2014).The mixed methods design of this secondary analysis provides some distinct advantages in the triangulation of data, in this case, the focus group interview data lend to examining processes that unfold over time and emphasizing context, and the survey data facilitating comparison between groups (Creswell et al., 2014). The power of quantitative analyses in representing the CM domains is balanced in our study with the voices and perspectives of community members, a crucial step in testing theoretical frameworks against contextual, situated experience. The integration of quantitative and qualitative data provides an avenue for academics trained in Western, euro-centric traditions, to share the creation of suggested CM domains with community member's perceptions of said domains situated in context within our sample in rural Zambia.

The integration of data using concurrent mixed methods approaches works to enhance strengths of the qualitative and quantitative data, while minimizing weaknesses (Creswell et al., 2014). Using the merged approach, the quantitative and qualitative results for this aim will be presented together. According to Creswell et al., (2014) the integration of merged data is achieved through reporting quantitative (statistical) results and then using qualitative results that

align with, expand, or challenge quantitative results. For domains that were investigated through both focus group interviews and CM survey data collection, fit was assessed through an evaluation of confirmation, expansion, and discordance of the results (Fetters et al., 2013). We merged data for the CM domains that were collected in both the CM survey (collective efficacy, governance, perceived control, social acceptance/cohesion, self-efficacy, power in relationships) as well as the focus groups (social acceptance/cohesion, social support/networks, collective action, governance) in addition to CM domains that emerged latently in the focus groups. See Tables 4-6 for a depiction of the CM domains, questions asked, and inclusion in CM survey or focus groups.

Focus group and CM survey data were analyzed separately by our research team in parallel. For the quantitative analytics, we conducted a factor analysis to reduce the CM survey items, calculated descriptive statistics, mean scores, assessed for differences between groups, and change over time. For the content analytics, we immersed ourselves in the focus group database, developed an unconstrained categorization matrix, and conducted a content analysis. As certain CM domains (social acceptance/cohesion, social support/networks, collective action, governance) were directly targeted in the focus groups, these domains were used to structure the unconstrained categorization matrix, with room to add codes that emerged naturally. These methodological procedures enabled thematic and code searches of the database about CM domains that could be merged with the quantitative data. A joint display was constructed to illustrate the integration of the quantitative and qualitative data to increase legitimation during analysis (Li, Marquart, & Zercher, 2000; Onwuegbuzie & Burke Johnson, 2006).We then interpreted the data from our joint display and depicted the intersection of focus group data and CM survey data through use of a figure displaying how CM functioned in rural Zambia within

our sample. We further elucidated the triangulation of our data through a brief narrative description of the figure, weaving the qualitative and quantitative results.

Chapter 4 : Results

The final analyses included data from 1,203 individuals from two districts in Zambia. Specifically, there was individual survey data from four intervention sites from Mansa, five intervention sites in Lundazi, three comparison sites in Mansa, and five comparison sites in Lundazi. See Table 15 for a full depiction of the data obtained across intervention and comparison sites for the individual interviews and focus groups at baseline and endline. Women with babies comprised 32.5%, community members 32.8%, and health workers 34.7% of the total sample. The mean age of participants in the total sample was 38.24 years old (SD=13.34). Participants reported having lived in the communities where the data was being collected for an average of 26.46 years (SD=16.12). The majority (86.6%) of participants were married having on average 4.55 (SD=2.52) living children and very few (5.0%) reported having completed no formal education. Independent variables had missingness that ranged from n=0 (group) to n=19, 1.6% (highest level of formal education). See Table 7 for count, percent, mean and standard deviations of the total sample's variables separated by intervention and comparison site at baseline and endline.

Data were compared for differences in the independent variables collected characterizing participants at baseline, endline, as well as among and between intervention and comparison sites. The descriptive analyses represent participants who completed the CM survey as well as those who participated in the focus groups. The results of the bivariate descriptive analyses found significant differences between ZaMs intervention and comparison sites at baseline for the

variable time lived in the community (p=0.01), with participants reporting having lived in the comparison communities for more years (M=27, SD=18) than the intervention communities (M=23, SD=13). Significant differences were also found at baseline between intervention and comparison sites for the variable marital status (p=0.01), with a higher number of unmarried people (n=42, 14.84%) found in intervention communities than in comparison (n=21, 7.95%) communities. Level of education between intervention and comparison communities was also found to be significantly different (p<0.001) between sites, with intervention site participants reporting having completed more secondary or tertiary education (n=161, 56.49%) than comparison sites (n=112, 43.08%). Of note, biological sex was only collected at baseline, however no significant differences were found between intervention and comparison sites at that time (p=0.29). At endline, no significant differences were found between intervention and comparison sites with respect to the independent variables collected.

Examining intervention sites from baseline to endline indicated significant differences for the variables: age (p<0.001), time in the community (p<0.001), and number of living children (p=0.02). Participants were older on average at endline, had lived in the community longer, and reported having more living children. Significant differences were found among comparison sites from baseline to endline for the variable marital status (p=0.003), with a higher number of unmarried participants at endline. For a complete review of our descriptive analyses see Table 7.

The CM survey items were also explored for differences in response between intervention and comparison sites at baseline and endline, as well as differences between intervention sites from baseline to endline and comparison sites from baseline to endline using Chi-square tests of independence. There was a low amount of missingness for the items on the CM survey. The lowest amount of missing responses was from a self-efficacy item (n=5, 0.4%),

and the highest amount of missing responses was from a power in relationships item (n=44, 3.7%). See Table 8 for a complete depiction of missingness of each item and bivariate analyses outcomes.

There was a significant difference (p=0.02) between intervention and comparison sites at baseline for one item on the self -efficacy scale, "I can usually organize people to get things done," with comparison participants reporting a higher number of 'yes' responses, (n=214, 81.37%) than intervention participants, (n=208, 72.98%). Another item on the self-efficacy scale, "I am often a leader in groups," approached significance (p=0.06) with comparison sites reporting a higher number of 'yes' responses (n=179, 67.04%) than intervention sites (n=169, 59.3%). The collective efficacy scale item, "I believe a community can have a say in changing the conditions of their lives," was significantly different (p=0.03) between intervention and comparison sites, with more intervention site participants with 'yes' responses. All three items in the power in relationships scale had significant differences between intervention and comparison sites with comparison sites reporting more 'yes' responses to each of the questions. Two items, "Using a condom every time I have sex with my partner would make my partner angry," (p=0.03) and, " Using a condom every time I have sex would make my partner not trust me," (p=0.04) were also significantly different at baseline between intervention and comparison sites. The third item, "Using a condom every time I have sex would make my partner not trust me," had a p-value of <0.001.

Differences in participant response to the CM survey at intervention sites from baseline to endline were also examined. The results of the chi-square analyses demonstrated significant differences among the intervention sites with p-values <0.001 for all three items on the self-efficacy scale, with a higher number of 'yes' responses among intervention sites at endline. One

item on the self-efficacy scale was found to be statistically significant comparing intervention to comparison sites at baseline, with a higher percentage of 'yes' responses in the comparison communities ($p<0.001$), for the item, "I can usually organize people to get things done.

The collective efficacy scale had two out of the four items ("I believe a community can talk about issues that involve them freely among themselves." and "I believe a community can hold group meetings to talk about issues that involve them.") that showed significant differences with a p-value=0.04, in participant response from baseline to endline among intervention sites. One item out of the three items on the power in relationships scale, "Using a condom every time I have sex would make my partner think I don't trust them," was significantly different between baseline and endline among intervention sites with a p-value=0.01. One item on the governance scale, "This group is successful in achieving its goals," showed a statistically significant difference ($p=0.03$) between intervention and comparison sites at baseline, with intervention sites recording a higher number of 'yes' responses. All three items on the governance scale were significantly different ($p<0.001$) among intervention sites between baseline and endline. Comparison site participant responses showed significant differences in response patterns between baseline and endline for all three items on the governance scale, and no significant differences for any of the other items. For a complete depiction of the response patterns between and among intervention and comparison sites at baseline and endline, see Table 8.

Results by Aim

Sub-Aim 1 Results

The factorial structure of the 19-item CM survey was analyzed using various rotations to identify the factor structure that was most suitable both statistically and conceptually for our dataset. Factors that emerged in the analyses were not named until a suitable analysis was

decided upon, rather referred to in the results as 'construct 1, construct 2," etc. Prior to analysis the suitability of the data for factor analysis was assessed. Our baseline sample of 554 and endline sample of 649 reflected an adequate number of cases to allow us to explore the factor structure at two timepoints. Each of the analyses has an associated table with results generated that can be located in Appendix B.

Baseline data with oblimin rotation. We began by testing the baseline data using oblimin rotation, assuming correlation between the items on the CM survey. The Kaiser-Meyer-Olkin (KMO) value was 0.743 and Bartlett's test indicated significance at $p < 0.01$. Principal axis factor analysis revealed the presence of five components with eigenvalues greater than one cumulatively explaining 42% of the variance. The scree plot appeared to have two subtle points of inflection at two and five respectively, although the fifth point appeared near the cutoff value of one. The factor loadings in the pattern and structure matrices reveal three of the newly formed factors with factor loadings at >0.6, with multiple items as high as 0.8. The internal consistency reliability of the factors using Cronbach's alpha found one of the factors had internal consistency reliability at 0.8, two factors at 0.7, one at 0.6, and the remaining factor at 0.5.

Despite the high factor loadings in the pattern and structure matrices, the items that loaded together conceptually fit well together for only one of the newly formed factors (construct 2) relating to power in relationships. For example, construct 3 paired together items relating to community and group decisions as they pertain to impacting individual's lives, group success in goal achievement, and individual influence over group decisions. Another factor (construct 1) had high loadings of >0.8 across both pattern and structure matrices for three items that conceptually fit together relating to leadership, with a fourth item that did not fit as well, loading at 0.33 in the pattern matrix and 0.43 in the structure matrix, that focused on individual

satisfaction with influence over group decisions. The decision was made to next analyze the baseline data using varimax rotation.

Baseline data with varimax rotation. The baseline data were then examined using varimax rotation, which assumes the items were not correlated. The sample was found to be adequate for factor analysis with KMO 0.743 and Bartlett's test significant at <0.01. The varimax rotation method on the baseline data extracted five factors with eigenvalues >1, explaining cumulatively 41% of the variance. The scree plot had a clear point of inflection following the fifth point, falling above but near the eigen value of one on the Y-axis. The rotated factor matrix showed three factors that emerge with factor loadings of >0.8 and >0.7, another factor with loadings >0.6, and the final factor with loadings ranging from >0.4-0.7. Testing the internal reliability showed three of the factors with Cronbach's alpha at ≥0.7 and the remaining factor at 0.6. One item, "I am satisfied with the amount of change I have over decisions that this group makes," loaded poorly onto two factors with a range from 0.2-0.4, similar to the baseline with oblimin rotation analysis. Comparison of the baseline data rotated with varimax and oblimin revealed similar results, with slightly higher factor loadings in the varimax rotation. The decision was made to next check the endline data to evaluate whether combining the data from baseline and endline would be feasible for analysis.

Endline data with oblimin rotation. We then moved to evaluation of our endline data with oblimin rotation which revealed an adequate sample with KMO value of 0.763 and Bartlett's test indicating significance at <0.01. Using principal axis factor extraction, six factors emerged in the final factor solution with eigenvalues >1, explaining 36% of the variance. The scree plot indicated six factors, however the fifth and sixth factors rest very near the cutoff at an eigenvalue of one on the Y-axis, with a clear break after the third and fifth points. The factor

loadings in the pattern and structure matrices were all >0.05 with the exception of one item which emerged at 0.391/0.444 in the pattern and structure matrices respectively. The internal consistency reliability of these factors were >0.7 for one factor, 0.7 for two factors, 0.5 for one factor, with the final two factor's Cronbach's alpha <0.5. The items in each factor conceptually made sense for four of the factors in this iteration (constructs 1-4) however two of the factors that emerged (constructs 5-6) included items that did not conceptually fit well together, each only containing two items. The two items that loaded onto one of the factors (construct 5) were not conceptually well matched, as one of the items pertained to group success in goal achievement and the other to individual satisfaction with control over group decisions.

Endline data with varimax rotation. The endline data were then analyzed using varimax rotation, finding a KMO of 0.763 and the Bartlett's test indicating significance at <0.01. Here, six factors were generated explaining 36% of the variance in the model. The scree plot had a clear inflection point at the sixth point, yet this point rested on the line with the eigenvalue of one, making it less clear whether or not this best represented a five or six factor solution. The rotated component matrix revealed the presence of six factors with factor loadings that ranged from >0.3->0.7. Two of the resulting factors had all of the items loading at >0.5 or higher (constructs 2 and 3). One of the factors had two items loading at 0.7, two items loading at 0.5, one item loading at 0.4, and a sixth item loading at 0.3. Two of the factors that emerged contained only two items (constructs 5 and 6) and neither of these factors contained items that conceptually fit. Internal consistency reliability using Cronbach's alpha was 0.7 for three factors, 0.5 for one factor, and 0.4 for the remaining two factors.

The baseline data indicated a five factor solution with both varimax and oblimin rotation, while the endline data indicated a six factor solution using both varimax and oblimin rotation.

Reliability for the sixth factor in the endline data were low (<0.4) in both varimax and oblimin rotation. The data from baseline and endline created factor solutions that were similar. Therefore, combining the baseline and endline data for one sample using oblimin and varimax rotations were attempted next.

Combined sample oblimin rotation. The combined sample of baseline and endline data was next analyzed using oblimin rotation, assuming correlation between the CM survey items. The KMO value was 0.776, indicating adequacy of our sample, and the Bartlett's test showed significance at <0.01, confirming homoscedasticity of our data. Principal axis factoring resulted in a five factor solution that cumulatively accounted for 37% of the variance. The scree test indicated five points, yet there were two points of inflection (one at the third point and one at the fifth point), with the fifth point resting on the line at the eigenvalue of 1. The pattern and structure matrices had factor loadings that ranged between 0.3-0.8. Two factors that emerged had loadings that ranged between >0.6-0.8 while the remaining two had a mix of factor loadings with ranges between 0.3-0.7. The item, "I can control decision that involve my community," loaded onto four factors ranging from >0.1-0.3 in the pattern matrix and >0.1- 0.4 in the structure matrix. The item, "I feel satisfied with the amount of change I have over decisions that this group makes," loaded onto three factors ranging from 0.3-0.5 in the structure matrix and >0.1->0.4 in the pattern matrix. Cronbach's alpha testing indicated internal consistency reliability at 0.8 for one factor, 0.7 for two factors, 0.6 for one factor, with the fifth factor's reliability at a value of 0.5. Conceptually, the factors that emerged in this analysis were not consistent with a solution that reflects constructs that make sense. For instance, items in one of the factors that emerged combined statements about group decision making with community influence on personal life

choices, group success in goal achievement, and personal influence over group and community decisions. For these reasons, varimax rotation was next attempted with the full sample.

Combined sample varimax. The full sample using combined baseline and endline data was examined using varimax rotation, positioning the items as uncorrelated. The KMO value was 0.776 and Bartlett's test was significant at <0.01, both supporting factorability. Five factors arose with eigenvalues >1, cumulatively explaining 37% of the variance. The scree plot had two inflection points, one after the second point, and another following the third point. Four points on the scree plot were well above the eigenvalue of 1, with the fifth point resting on the line with an eigenvalue of 1. The rotated component matrix indicated one factor loading between 0.6-0.7 with three items that fit conceptually well. Another factor contained five items with a range of factor loadings between 0.3-0.7 that did not conceptually fit together covering topics that span both community and individual control over choices, goals, and influence. A third factor (construct 3) contains factor loadings ranging from 0.4-0.7, yet the items did fit together conceptually with a focus on individual beliefs about community. A fourth factor revealed factor loadings on three items ranging between 0.5-0.7 with items that also hung together theoretically, focused on power in relationships. The final factor (construct 5) emerged with factor loadings between 0.2-0.4, including two items that were not matched conceptually, one focused on individual control over decisions and the other relating to a community's ability to obtain resources. One item in the fifth factor, "I can control decisions that involve my community", did not load onto any of the factors well, loading on factors 1, 2, and 5 with factor loadings between 0.33-0.34. Despite this, varimax rotation appeared to create a factor structure that most accurately aligned with the concepts being analyzed. Internal reliability of the five factors indicated one factor (construct 1) with a Cronbach's alpha at 0.8, three factors with Cronbach's alpha at 0.7 (constructs 2-4), and

one with Cronbach's alpha at 0.2 (construct 5). The decision was made to further examine the data forcing a four factor solution due to the low factor loadings, low internal reliability, and only two items loading onto construct 5.

Combined sample varimax, forced four factor solution. The full sample with a varimax rotation and a forced four factor structure was next evaluated. The KMO value was 0.776 again indicating adequacy of the sample for factorability and Bartlett's test showed significance at <0.01. The forced four factor solution cumulatively explained 34.7% of the variance in the model. The scree plot had four points well above the eigenvalue of 1, yet there was a questionable point of inflection at the third point as well as after the fourth point. The rotated factor matrix illustrated factor loadings onto the four factors in range from <0.3->0.7. The internal reliability for the forced four factor solution was >0.6 for one factor, 0.7 for another, and >0.7 for the remaining two factors. Despite the high internal consistency reliability, the factor loadings were overall lower than the unforced solution with multiple factor loadings that emerged as <0.5. Additionally, the forced solution created two factors that contained items that conceptually did not fit well together. For example, one of these (construct 2) included items regarding individual control over group choices, individual satisfaction with control over group decisions, community control over individual choices, and community group success in achieving goals. The other factor that was forced that did not make sense conceptually (construct 3) included three items focused on individual leadership and a fourth item that loaded poorly at 0.304 focused on individual satisfaction with control over decisions involving the community. The decision was made to next review the results of a forced three factor solution using varimax rotation on the combined sample.

Combined sample varimax, forced three factor solution. Using the full sample of baseline and endline data with a varimax rotation and forced three factor solution, the KMO value was 0.776 and Bartlett's test indicated significance at <0.01, indicating that when forced into three factor structure the items do not fit well with other items in their component. Ten items had communalities <0.3 and the remaining nine items had communalities of 0.4 or less. The scree plot had a clear point of inflection at the third point, but four points remained above the eigenvalue of 1. This analysis indicated the forced three factor solution cumulatively explained 30% of the variance. The first factor that emerged mixed concepts of individual leadership, individual control over community decisions, individual satisfaction, and community group influence over goal achievement, and community group influence over individual's lives. This factor (construct 1) while conceptually not fitting well, also had lower factor loadings than previously tested analyses, with three factors loading >0.4, five factors loading at >0.5, and two factors loading at 0.6. The second factor in the matrix (construct 2) had factor loadings of >0.6 for two items, 0.5 for two items, 0.4 for one item, and 0.3 for the final item included in the factor. The items included in this newly created factor (construct 2) focused on individual beliefs about community cohesiveness, with an additional factor related to an individual's perception of their community as a good place to live. The rotated factor matrix showed one factor (construct 3) with factor loadings that were 0.5, 0.7, 0.7 that conceptually connected as each question related to issues of power in sexual relationships. Internal consistency reliability tested using Cronbach's alpha was indicated at 0.8 (construct 1), 0.6 (construct 2), and 0.7 (construct 3).

Final solution. It was determined that forcing a factor solution did not improve conceptual clarity and so a final solution was run with principal axis factoring with varimax rotation with items removed that had not loaded highly based on previous iterations. This

solution resulted in four factors with KMO of 0.717 and Bartlett's showing significance at <0.01. The four factor structure that emerged in the analysis included the constructs of self-efficacy, collective efficacy, power in relationships, and governance. This factor structure was confirmed by the scree test and the fact that 41% percent of the total variance in the scale was explained by these four factors extracted. Varimax rotation was used, assuming that the four proposed factors are uncorrelated to one another. Each item of the scale loaded cleanly onto the four factors with factor loadings between 0.5-0.8. Cronbach's alpha for one of the factors was 0.8 (self-efficacy), for two factors was 0.7 (collective efficacy, power in relationships) and for one factor (governance) was 0.6. Conceptually the factors fit together in accordance with the constructs they represent. A table with internal consistency reliability, eigenvalues, communalities, factor loadings, and origin of survey items is present in Table 9.

Aim 1 Results

Self-efficacy factor. Bivariate analyses showed statistically significant differences in the mean score of the self-efficacy factor among the intervention sites from baseline (M=2.07, SD=1.16) to endline (M=2.5, SD=0.86) with a $p<0.01$. Differences between the intervention (M=2.07, SD=1.16) and comparison (M=2.26, SD=1.07) sites mean self-efficacy scores at baseline approached significance ($p=0.06$). Differences in the comparison sites self-efficacy mean scores were 2.26 (SD=1.07) at baseline and 2.43 (SD=0.96) at endline which also showed significance at $p=0.05$. The self-efficacy scores between intervention and comparison sites at endline showed no statistically significant differences. For a complete depiction of the bivariate analyses of factor scores between and among sites at baseline and endline, see Table 10.

Ordinary least squares multiple regression was used to predict change in the self-efficacy factor controlling for the independent covariates time (baseline to endline), site (intervention vs.

comparison), group, time lived in the community, age, marital status, number of living children and highest level of formal education. The final sample size for the self-efficacy factor regression (N=1,133) represented an adequate sample to conduct the analysis. Preliminary analyses were conducted to ensure no violation of the assumptions of linearity, normality, multicollinearity, and homoscedasticity. The total variance explained by the model as a whole was 32.42%, $F(10, 1122)=53.83$, $p<0.001$.

The independent variables time, group, age, and level of education were significant in the regression model. The score for the self-efficacy factor increased from baseline to endline by 0.21 (95%CI=0.11,0.31 , $p<0.001$) with an effect size at 0.10. There was no statistically significant difference between the intervention and comparison sites in self-efficacy factor scores. When compared to the women with babies group, the score for the self-efficacy factor was higher for community members by 0.34 (95%CI=0.19,0.49, $p<0.001$) with an effect size at 0.16. For health workers, the self-efficacy factor score was higher when compared to women with babies by 0.61 (95%CI=0.45,0.77, $p<0.001$) with an effect size at 0.28. As age increased, self-efficacy factor scores increased for all communities by 0.02 (95%CI=0.01,0.02, $p<0.001$) with an effect size of 0.23. Compared to those with the highest level of formal education reported, those with no education (b=-0.85, 95%CI=-1.10,-0.60, p, <0.001) or having completed some or all of primary school (b=-0.48, 95%CI=-0.60, -0.38, $p<0.001$) had lower self-efficacy scores. For a full depiction of the results of the self-efficacy factor regression, see Table 11.

Interaction effects between group and time showed no statistically significant changes in the self-efficacy factor, despite significance in the prior model without interaction effects. The interaction effect between the independent variables time (baseline vs. endline) and site

(intervention vs. comparison) showed all the increases in the self-efficacy factor isolated within the intervention communities (b=0.34, p<0.001).

Collective efficacy factor. The results of the bivariate analyses exploring differences in mean scores between and among the intervention and comparison sites at baseline and endline showed no statistically significant differences. Differences in the mean score between intervention (M=3.74, SD=0.70) and comparison (M=3.84, SD=0.49) sites approached significance at baseline with p=0.06. Similarly, at endline differences in the mean score between intervention (M=3.70, SD=0.78) and comparison (M=3.81, SD=0.58) sites approached significance with p=0.06. For a full depiction of the bivariate analyses of the collective efficacy factor between and among sites at baseline and endline refer to Table 12.

The collective efficacy factor was next examined using the same multivariable model as the self-efficacy factor to predict change in the factor controlling for all independent covariates. The final sample size for the regression was adequate for the analysis at N=1,119. Preliminary analyses ensured no violation of the assumptions of linearity, normality, multicollinearity, or homoscedasticity. The total variance explained by the model as a whole was 7.0%, $F(10, 1108)=8.38$, p<0.001.

There were no statistically significant differences between baseline and endline in the collective efficacy factor scores, controlling for all other covariates. The collective efficacy factor regression showed a statistically significant difference between the intervention and comparison sites, with intervention sites showing a decreased score (b=-0.11, 95%CI=-0.18,-0.03, p=0.005), with a small effect size of -0.05. The variable group showed significant differences, with community members (b=0.21, 95%CI=0.10,0.32, p<0.001) and health workers (b=0.21, 95%CI=0.09,0.33, p<0.001) having higher collective efficacy scores when compared to

the women with babies group. The effect size for the group variable was modest at 0.15. Level of formal education was significant in the collective efficacy factor score regression with those having no formal education (b=-0.26, 95%CI=-0.45,-0.07, p=0.008) with lower collective efficacy scores than those participants who reported completing some or all secondary or tertiary education, with a small effect size of -0.08. For a full depiction of the results of the collective efficacy factor regression, see Table 12.

The interaction effects between time (baseline to endline) and site (intervention to comparison) or time showed no statistically significant results, despite statistical significance of the intervention sites in the model without interaction effects. The interaction between time and group (women, community members, health workers) had no statistically significant results, despite statistically significance of the group variable in the prior model.

Power in relationships factor. The mean scores between intervention (M=1.41, SD=1.22) and comparison (M=1.78, SD=1.16) sites showed significant differences at baseline with $p<0.001$. Similarly, at endline the comparison sites showed statistically significant higher (M=1.81, SD=1.17) mean power in relationship scores when compared to the intervention sites (M=1.58, SD=1.17) with p=0.01. For a complete depiction of the bivariate analyses of the power in relationships factor between and among sites across time, see Table 13.

The power in relationships factor was next explored using the same multivariable model as the self-efficacy and collective efficacy factors. The final sample size of N=1,086 was adequate for the regression. Preliminary analyses ensured no violation of the assumptions of linearity, normality, multicollinearity, or homoscedasticity. The total variance explained by the model as a whole was 4.1%, $F(10, 1075)=4.57$, $p<0.001$.

The variables time, site, and number of living children showed statistical significance in the regression model. There was an increase in power in relationships scores from baseline to endline by 0.11 (95%CI=-0.03,0.25, p<0.001) with a small effect size of 0.05. The intervention communities had decreased power in relationship scores (b=-0.25, 95%CI=-0.39,-0.11, p<0.001) with an effect size of -0.11 when contrasted with comparison communities, controlling for all other covariates. As the number of living children increased, the power in relationships score decreased by 0.05 (95%CI=-0.38,0.35, p=0.02), with an effect size of -0.10. For a full display of the results of the power in relationships factor multivariate regression, see Table 13.

The interaction effect of time and site showed no statistical significance despite statistical significance of each of these variables in the prior model. The interaction effect of time and group also showed no statistical significance.

Governance factor. There were statistically significant differences between the mean scores of the governance factor among the intervention sites from baseline (M=2.03, SD=1.09) to endline (M=2.53, SD=0.66), p<0.001. Similarly, there were statistically significant differences in the mean score of the governance factor among the comparison sites from baseline (M=1.95, SD=1.17) to endline (M=2.66, SD=0.57), with p<0.001. Statistically significant differences were found in the mean score of the governance factor between intervention and comparison sites at endline, with intervention sites having a mean score of 2.53(SD=0.66), which was lower than the comparison sites mean of 2.66(SD=0.57), p=0.01. See Table 10 for a full display of the bivariate descriptive analyses of the governance factor across time between and among sites.

The governance factor was explored using the same multivariable model as the self-efficacy, collective efficacy, and power in relationships factors including the covariates of time, site, group, time lived in the community, age, marital status, number of living children and

highest level of formal education. The final sample size of N=1,127 was adequate for the regression. Preliminary analyses ensured no violation of the assumptions of linearity, normality, multicollinearity, or homoscedasticity. The total variance explained by the model as a whole was 12.8%, $F(10, 1116)=16.32$, $p<0.001$.

The governance factor regression showed statistical significance with the time variable, with increases in the governance factor scores at endline by 0.61 (95%CI=0.51,0.72, $p<0.001$). The variable site had no statistically significant impact on the governance factor. Health workers had higher governance scores by 0.18 (95%CI=0.01,0.35, p=0.03) when compared to women with babies and community members had higher scores compared to the women with babies group by 0.15 (95%CI=0.01,0.35), approaching significance at p=0.06. As the number of living children reported by participants increased, the governance factor decreased by 0.03 (95%CI=-0.06,-0.00, p=0.03). When compared to those who reported having completed some or all secondary or tertiary education, those with no formal education had lower governance scores by 0.37 (95%CI=-0.62,-0.11,p=0.006), with an effect size of -0.08. For a complete depiction of the results of governance factor regression, see Table 14.

The interaction effects model with the governance factor examining time and site was not statistically significant. There were no statistically significant variables in the interaction effects model between time and group, despite significance in the original model of each of these variables.

Table 7. Characteristics of ZaMS Intervention and Comparison Sites at Baseline and Endline, N=1,202

	ZaMS n=286(51.72%)	**Comparison** n=267(48.28%)		**ZaMS** n=366(56.39%)	**Comparison** 283(43.61%)		**Comparing ZaMs Sites from baseline to endline**	**Comparing Comparison Sites from baseline to endline**
	Baseline			**Endline**				
	n(%)	n(%)	*p*-value	n(%)	n(%)	*p*-value	*p*-value	*p*-value
Group			0.35[a]			0.64[a]	0.17[a]	0.13[a]
Women with babies	91(31.82)	98(36.7)		117(31.97)	85(30.04)			
Health workers	98(34.27)	92(34.46)		130(35.52)	96(33.92)			
Community members	97(33.92)	77(28.84)		119(32.51)	102(36.04)			
Age (in years), mean(SD)	36.16(12.8)	37.27(13.85)	0.33[b]	39.81(13.55)	39.23(12.82)	0.58[b]	<0.001	0.09[b]
Sex*			0.29[a]			--		--
Female	209(73.33)	185(69.29)		--	--			
Male	76(26.67)	82(30.71)		--	--			
Time in the community (in years), mean(SD)	23(14)	27(18)	0.01[b]	28(16)	27(16)	0.58[b]	<0.001[b]	0.74[b]
Marital status			0.01[a]			0.43	0.77[a]	0.003[a]
Married	241(85.16)	243(92.05)		306(85.96)	231(83.7)			
Unmarried	42(14.84)	21(7.95)		50(14.04)	95(15.03)			
Number of living children, mean(SD)	4.27(2.64)	4.47(2.63)	0.37[b]	4.7(2.42)	4.62(2.39)	0.48[b]	0.02[b]	0.49[b]
Level of education			0.006[a]			0.72[a]	0.19[a]	0.14[a]
None	14(4.91)	13(5.0)		20(5.54)	12(4.33)			
Some or completed primary	110(38.6)	135(51.92)		163(45.15)	122(44.67)			
Some or completed secondary or tertiary	161(56.49)	112(43.08)		178(49.31)	143(51.62)			

[a]chi-square test used to compare proportions, [b]independent t-test used to compare means, *sex only collected at baseline

Table 8. Comparing Individual Survey Data Questions at Baseline and Endline between and among Sites, N=1,202

	ZaMS 286(51.72)	**Comparison** 267(48.28)		**ZaMS** 366(56.39)	**Comparison** 283(43.61%)		**Comparing ZaMs sites baseline to endline**	**Comparing Comparison sites baseline to endline**
Survey items(n,%, missing)	**Baseline**			**Endline**				
	n(%)	n(%)	*p*-value	n(%)	n(%)	*p*-value	*p*-value	*p*-value
Self-efficacy								
I am often a leader in groups (5,0.4)			0.06			0.80	<0.001	0.08
Yes	169(59.3)	179(67.04)		273(74.79)	207(73.93)			
No	116(40.7)	88(32.96)		92(25.21)	73(26.07)			
I find it very easy to talk in front of groups (5,0.4)			0.58			0.29	<0.001	0.09
Yes	215(75.44)	206(77.44)		315(86.3)	234(83.27)			
No	70(24.56)	60(22.56)		50(13.7)	47(16.73)			
I can usually organize people to get things done(8,0.7)			0.02			0.20	<0.001	0.21
Yes	208(72.98)	214(81.37)		324(88.77)	240(85.41)			
No	77(27.02)	49(18.63)		41(11.23)	41(14.59)			
Collective efficacy								
I believe that a community can talk about the issues that involve them freely among themselves(10, 0.8)			0.07			0.03	0.04	0.10
Yes	262(92.25)	254(95.85)		317(87.33)	259(92.5)			
No	22(7.75)	11(4.15)		46(12.67)	21(7.5)			
I believe a community can hold group meetings to talk about issues that involve them(8, 0.7)			0.63			0.30	0.01	0.06
Yes	271(95.42)	256(96.24)		328(90.11)	259(92.5)			
No	13(4.58)	10(3.76)		36(9.89)	21(7.5)			
I believe a community can work with current community groups to deal with issues that involve them(9, 0.7)			0.22			0.19	0.11	0.14
Yes	264(92.63)	254(95.13)		344(95.56)	274(97.51)			

No	21(7.37)	34(6.16)		16(4.44)	7(2.49)			
I believe that a community can have a say in changing the conditions of their lives(16, 1.3)			0.03			0.09	0.10	0.36
Yes	261(92.23)	253(96.56)		345(95.3)	273(97.85)			
No	22(7.77)	9(3.44)		17(4.7)	6(2.15)			
Power in relationships								
Using a condom every time I have sex with my partner would make my partner angry(44,3.7)			0.03			0.44	0.12	0.98
Yes	124(45.59)	137(54.8)		187(51.8)	151(54.91)			
No	148(54.41)	113(45.2)		174(48.2)	124(45.09)			
Using a condom every time I have sex with my partner would make my partner not trust me(25,2.1)			0.04			0.002	0.56	0.72
Yes	147(54.24)	166(62.88)		189(51.92)	179(64.39)			
No	124(45.76)	98(37.12)		175(48.08)	99(35.61)			
Using a condom every time I have sex would make my partner think I don't trust them(43,3.6)			<0.001			0.02	0.01	0.84
Yes	116(42.8)	157(62.8)		192(53.04)	171(61.96)			
No	155(57.2)	93(37.2)		170(46.96)	105(38.04)			
Governance								
I can influence the decisions that this group makes(13,1.1)			0.07			0.07	<0.001	<0.001
Yes	179(63.03)	147(55.47)		305(83.79)	245(88.77)			
No	105(39.97)	118(44.53)		59(16.21)	31(11.23)			
This group has control over decisions that involve my life(10, 0.8)			0.07			<0.001	<0.001	<0.001
Yes	162(56.84)	171(64.29)		283(77.75)	253(91.34)			
No	123(43.16)	95(35.71)		81(22.25)	24(8.66)			
This group is successful in achieving its goals(12, 1.0)			0.03			0.01	<0.001	0.002
Yes	233(82.33)	199(74.81)		334(91.76)	237(89.08)			
No	50(17.67)	67(25.19)		30(8.24)	70(10.92)			

p-values calculated using chi-square

Table 9. Final four factor solution

Factor	Construct	Cronbach's alpha	Eigenvalue	Communalities (initial, final)	Factor loading	Variable	Original use
1	*Self-efficacy*	0.8	2.75				Romero et al (2006); Zimmerman & Zahniser(1991)
				(0.37, 0.53)	0.71	I find it very easy to talk in front of groups.	
				(0.39, 0.57)	0.72	I am often a leader in groups.	
				(0.38, 0.50)	0.63	I can usually organize people to get things done.	
2	*Collective efficacy*	0.7	2.03				Romero et al. (2006); Sood (1999)
				(0.28,0.41)	0.64	I believe that a community can talk about the issues that involve them freely among themselves.	
				(0.28,0.47)	0.69	I believe a community can hold group meetings to talk about issues that involve them.	
				(0.16, 0.20)	0.43	I believe a community can work with current community groups to deal with issues that involve them.	
				(0.21,0.28)	0.51	I believe that a community can have a say in changing the conditions of their lives.	
3	*Power in relationships*	0.71	1.66				Romero et al. (2006)
				(0.22,0.31)	0.56	Using a condom every time with my partner would make my partner angry.	
				(0.35,0.57)	0.75	Using a condom every time I have sex would make my partner think I don't trust them.	
				(0.34,0.51)	0.75	Using a condom every time with my partner would make my partner not trust me.	
4	*Governance*	0.62	1.25				Romero et al. (2006); Israel et al. (1994)
				(0.26,0.40)	0.56	I can influence the decisions that this group makes.	

		(0.21,0.39)	0.62	This group has control over decisions that involve my life.
		(0.17,0.29)	0.54	This group is successful in achieving its goals.

Table 10. Comparing factors at baseline and endline between and among sites

	ZaMS	Comparison		ZaMS	Comparison		Comparing ZaMS sites from baseline to endline	Comparing Comparison sites from baseline to endline
	Baseline			**Endline**				
	Mean(SD)	Mean(SD)	*p*-value	Mean(SD)	Mean(SD)	*p*-value	*p*-value*	*p*-value
Self-efficacy factor n=1189 ◊(14,1.2%)	2.07(1.16)	2.26(1.07)	0.06	2.5(0.86)	2.43(0.96)	0.33	<0.001	0.05
Collective efficacy factor n=1173 ◊ (30, 2.5%)	3.74(0.70)	3.84(0.49)	0.06	3.70(0.78)	3.81(0.58)	0.06	0.49	0.48
Power in relationships factor n=1140 ◊ (63, 5.2%)	1.41(1.22)	1.78(1.16)	<0.001	1.58(1.17)	1.81(1.17)	0.01	0.08	0.74
Governance factor n=1181 ◊ (22,1.8%)	2.03(1.09)	1.95(1.17)	0.38	2.53(0.66)	2.66(0.57)	0.01	<0.001	<0.001

◊missing (n,%)
p-values calculated using t-test

Table 11. Multivariable linear regression of self-efficacy factor (N=1,133)

Covariates	Unstandardized beta coefficient	95% CI	*p*-value	Standardized beta coefficient
Time				
Baseline	--	--	--	--
Endline	0.21	(0.11,0.31)	<0.001	0.10
Site				
Comparison	--	--	--	--
ZaMS	-0.6	(-0.16,0.04)	0.22	-0.03
Group				
Women with babies	--	--	--	--
Community members	0.34	(0.19,0.49)	<0.001	0.16
Health workers	0.61	(0.45,0.77)	<0.001	0.28
Time lived in the community	0.01	(-0.003,0.005)	0.75	0.01
Age	0.02	(0.01,0.02)	<0.001	0.23
Marital status				
Married	--	--	--	--
Unmarried	0.03	(-0.12,0.18)	0.69	0.01
Number of living children	0.02	(-0.01,0.05)	0.13	0.05
Highest level of education				
None	-0.85	(-1.10,-0.60)	<0.001	-0.17
Some or completed primary	-0.48	(-0.60, -0.38)	<0.001	-0.23
Some or completed secondary or tertiary	--	--	--	--

Table 12. Multivariable linear regression of collective efficacy factor (N=1,119)

Covariates	Unstandardized beta coefficient	95% CI	*p*-value	Standardized beta coefficient
Time				
Baseline	--	--	--	--
Endline	-0.06	(-0.14,0.01)	0.11	-0.08
Site				
Comparison	--	--	--	--
ZaMS	-0.11	(-0.18,-0.03)	0.005	-0.05
Group				
Women with babies	--	--	--	--
Community members	0.21	(0.10,0.32)	<0.001	0.15
Health workers	0.21	(0.09,0.33)	<0.01	0.15
Time lived in the community	0.001	(-0.002,0.005)	0.38	0.03
Age	0.002	(-0.003,0.007)	0.366	0.05
Marital status				
Married	--	--	--	--
Unmarried	0.04	(-0.08,0.15)	0.51	0.02
Number of living children	0.01	(-0.01,0.03)	0.37	0.04
Highest level of education				
None	-0.26	(-0.45,-0.07)	0.008	-0.08
Some or completed primary	-0.08	(-0.16,-0.00)	0.05	-0.05
Some or completed secondary or tertiary	--	--	--	--

Table 13 . Multivariable linear regression of power in relationships factor (N=1,086)

Covariates	Unstandardized beta coefficient	95% CI	*p*-value	Standardized beta coefficient
Time				
Baseline	--	--	--	--
Endline	0.11	(-0.03,0.25)	<0.001	0.05
Site				
Comparison	--	--	--	--
ZaMS	-0.25	(-0.39,-0.11)	<0.001	-0.11
Group				
Women with babies	--	--	--	--
Community members	0.13	(-0.07,0.34)	0.10	0.05
Health workers	-0.20	(-0.42,0.03)	0.09	-0.08
Time lived in the community	0.002	(-0.004,0.008)	0.58	0.02
Age	0.005	(-0.004,0.01)	0.27	0.06
Marital status				
Married	--	--	--	--
Unmarried	-0.19	(-0.41,0.02)	0.08	-0.05
Number of living children	-0.05	(-0.08,-0.01)	0.02	-0.10
Highest level of education				
None	-0.01	(-0.38,0.35)	0.95	-0.002
Some or completed primary	0.17	(0.02,0.32)	0.05	0.07
Some or completed secondary or tertiary	--	--	--	--

Table 14. Multivariable linear regression of governance factor (N=1,127)

Covariates	Unstandardized beta coefficient	95% CI	*p*-value	Standardized beta coefficient
Time				
Baseline	--	--	--	--
Endline	0.61	(0.51,0.72)	<0.001	0.32
Site				
Comparison	--	--	--	--
ZaMS	-0.02	(-0.13,0.08)	0.71	-0.01
Group				
Women with babies	--	--	--	--
Community members	0.15	c	0.06	0.07
Health workers	0.18	(0.01,0.35)	0.03	0.09
Time lived in the community	0.001	(-0.00,0.01)	0.51	0.03
Age	0.004	(-0.00,0.01)	0.21	0.06
Marital status				
Married	--	--	--	--
Unmarried	-0.09	(-0.25,0.06)	0.24	-0.03
Number of living children	-0.03	(-0.06,-0.00)	0.03	-0.09
Highest level of education				
None	-0.37	(-0.62,-0.11)	0.006	-0.08
Some or completed primary	0.03	(-0.08,0.15)	0.56	0.17
Some or completed secondary or tertiary	--	--	--	--

Table 15. Data obtained at baseline & endline for individual interviews and focus groups (N=1,202)

Site	n(% of total sample)	CM Survey data baseline	CM Survey data endline	Focus group data baseline	Focus group data endline
Mansa					
Intervention sites					
Lubende	69(5.3)	x	x	x	x
Mano	64(4.9)	x	x	x	x
Fimpulu	74(5.6)	x	x	x	x
Mutiti	74(5.6)	x	x	x	x
Lukola	31(2.4)	x	missing	x	x
Comparison sites		x			
Musaila	57(4.3)	x	x	x	x
Kabunda	69(5.3)	x	x	x	**missing
Mibenge	70(5.3)	x	x	x	x
Kundamfumu	31(2.4)	x	missing	x	**missing
Mu'wanguni	37(2.8)	x	missing	x	x
Lundazi					
Intervention sites					
**Mwase Lundazi	76(5.8)	x	x	**missing	x
Nkhanga	72(5.5)	x	x	x	x
Nyangwe	77(5.9)	x	x	x	x
Lusuntha	73(5.6)	x	x	x	x
Zumwanda	74(5.6)	x	x	x	x
Comparison sites					
Kapichila	79(6.0)	x	x	x	x
Kamsaro	71(5.4)	x	x	x	x
Lukwizizi	60(4.6)	x	x	x	x
Phikamalaza	69(5.3)	x	x	x	*missing
Chikomeni	75(5.7)	x	x	x	x

x=data collected from all three groups (women with babies, health workers, community members)
**missing women with babies data only
*missing health worker data only

Aim 2 Results

In total, 76 transcripts were available for analysis representing the voices of women with babies and health workers who participated in focus groups at 38 intervention sites and 38 comparison sites. Thirty-nine of the focus group transcripts analyzed were collected at baseline, representing 182 women with babies and 190 health workers. Thirty-seven of the focus group transcripts analyzed were collected at endline, representing 192 women with babies and 211 health workers. See Table 15 for a depiction of sites including count and percent of the total sample where data were collected.

The results of our content analysis using an unconstrained categorization matrix resulted in two main overarching codes that explored 1) barriers and 2) facilitators to women and girls obtaining healthcare during pregnancy and childbirth. The barriers theme emerged latently from the text within which two main themes emerged: 1) cultural barriers and 2) structural barriers. The facilitators theme contained one sub-theme (self-efficacy) that emerged latently from the text and four sub-themes (collective action, governance, social acceptance/cohesion, social support/networks) that were directly targeted through focus group questions. Each of the themes are explored in detail below, beginning with a description of barriers and ending with a depiction of the facilitators that emerged.

Barriers

Barriers to seeking and/or receiving healthcare during pregnancy and childbirth emerged as latent themes introduced by women and health workers across all communities. At baseline, there were a total of 687 barriers identified by women and health workers, at endline 617 were identified. Barriers were further separated into cultural and structural barriers to accessing

healthcare. At baseline a count of 199 cultural barriers were identified and at endline a count of 245 barriers emerged. The theme of cultural barriers was further clarified through sub-themes of 1) traditional gender roles and 2) traditional customs related to healthcare. Structural barriers to accessing care were further defined by 1) individual, 2) facility level, and 3) community level barriers. At baseline a count of 484 structural barriers emerged, at endline a count of 372 structural barriers were identified. See Table 16 for a complete breakdown of the count of themes and sub-themes identified by women with babies and health workers at baseline and endline. Counts of barriers were comparable between ZaMS and comparison sites at baseline. At endline, counts of structural and cultural barriers were slightly higher in ZaMS communities (refer to Table 16).

Table 16. Counts of themes and sub-themes at baseline and endline

	Baseline-2016		Endline-2018	
	Women with babies (n=182)	Health workers (n=190)	Women with babies (n=192)	Health workers (n=211)
Barriers	**296**	**387**	**279**	**338**
Cultural Barriers	**79**	**120**	**115**	**130**
a. Gender roles	12	15	31	37
i. Decision making	9	6	47	37
ii. Role of other family	4	6	2	2
b. Traditional customs related to healthcare	13	21	7	13
i. Loss mythology	24	28	14	21
iii. Maternal silence	2	9	4	7
iv. Traditional medicine	13	28	7	13
v. Maternal preparation (shaving)	2	7	3	0
Structural Barriers	**217**	**267**	**164**	**208**
a. Individual level	21	36	25	21
i. Food insecurity	4	5	1	3
ii. Financial insecurity related to birth supplies	17	26	24	18
b. Facility level	47	36	21	22
i. Disrespectful care	10	5	9	1
ii. Lack of privacy	7	11	3	10
iii. Fear/distrust of Western Medicine	5	3	6	2
iv. Male/Young staff	5	6	1	0
v. Shortage of medical staff	25	11	2	9
c. Community level	38	64	36	61
i. Delays related to distance/transportation	28	52	17	48
ii. Delays related to knowledge about delivering at a health facility	10	12	19	13
Facilitators	**72**	**96**	**164**	**169**
Community Mobilization	72	96	164	169

a. Collective action	21	57	45	50
b. Governance	8	11	18	39
c. Self-Efficacy*	9	6	47	37
c. Social Cohesion	68	56	146	125

*Questions eliciting this theme asked only at endline. See Appendix for focus group questions at baseline and endline.

Cultural Barriers

Traditional gender roles. Participants illustrated the ways in which traditional gender roles influenced pregnant and laboring women's care-seeking behaviors both with and without direct prompts in the focus group questions. At baseline there were 27 counts of this sub-theme and at endline there were 68 counts of this sub-theme. Women and health workers across communities echoed one another's sentiments about the influence of traditional gender roles on women's care-seeking behaviors during pregnancy and childbirth with the emergence of two primary examples around decision making and the role of other family members.

In different communities, both groups discussed the education of girls, providing a frame from which to understand traditional gender roles. When asked what she liked about her community and what she might like to see change, one woman stated, "what I would want to see change is girl's education in our community, most of the girls do not go to school, the old beliefs that a woman cannot be educated has continued in this area. Education is needed such that even those with children can still go back to school." In a different community, a health worker confirmed similar beliefs regarding gender roles, "… her will bearing children. That is the tradition that I know." Women and health workers described a primary role of women to care for the home and children, indicating this as a barrier to leaving the home to obtain care during childbirth. Multiple women discussed the inability to have a facility birth due to concerns for other children at home, presupposing that their husbands would not care for the children if they were left behind. For example, as one woman stated, "some men [husband] refuse us to come early at our small room which acts as our mother's shelter saying that who is going to be responsible for home chaos then we end up delivering at home." Another woman in a different

community echoed similar difficulty in being able to leave home, “others they say we can’t leave the children alone at home coming to the mother’s shelter.” Health workers across communities noted the issue of women not being able to simultaneously uphold their duties at home and birth in a facility. As one health worker pointed out when asked about barriers to facility birth, “others [women] it’s because they still have children at home who are still young and no one to take care of them and they end up delivering at home.”

Decision making. Power in decision making in relation to healthcare in pregnancy and childbirth was discussed as deferred to those other than the pregnant woman by both groups across communities. There were 15 counts of this category at baseline and 84 counts at endline. One woman described the authoritative punitive structures in place in her community around homebirth, “even the chief has taken part in the welfare of us mothers they work with nurses if you deliver at home they will take you to the palace you have to be punished, so the chief takes part in our decision making,” where women’s choices were heavily influenced by outside male authorities. Despite this authoritative decree that women should birth in a facility, women faced a double bind as they expressed a lack of control related to obtaining antenatal care and or facility birth. When asked about why a woman might birth at home rather than a facility, one woman verbalized, “some husbands refuse to allow their wives,” a sentiment expressed by multiple other women. Health workers echoed this as well. When asked who decides where a woman will birth her child, one health worker stated, “its both a man and a woman but in most cases a man has a final say.” Both women and health workers reported that people such as husbands, health workers, midwives, doctors, and other family members had control of the decision about where a woman would deliver her child.

Role of other family. Beyond their husbands, women were described as being instructed and directed by family members as to what was appropriate for them to do regarding their health during pregnancy and birth, which appeared as a barrier to facility use. Family members were also identified as culturally influential during the birth process and in the early identification of pregnancy. There were 10 counts of this theme at baseline, and four counts of this theme at endline. Cultural traditions such as the announcement of pregnancy were identified as the domain of the grandmother as described by this health worker, "cultural beliefs (when a woman is pregnant) we have one of the beliefs that we should wait for the grandmother to come and name the womb if someone does that it is an offence," potentially influencing the early obtainment of antenatal care. One woman in a different community echoed the influence of the grandmother's role in deciding when to seek care, indicating that indeed, this practice may delay antenatal care until late in the pregnancy. This was illustrated by the following quote,

> "me it is my grandmother. When I tell her that I did not have my period this month. She will say wait for this month if you don't attend then it is pregnancy you should go to the clinic. If you feel anything moving in inside then it is pregnancy it is a baby. Some takes three, four, five, six months if do that they tell you to go to the clinic so that they detect the problem,"

Parents and other family members were also identified as providing care during labor with the belief that their assistance would decrease the time a woman would spend in labor. As one health worker described,

> "the grandmother is present and she calls some close friends to come and help her, then they get a chitenge [fabric used as a dress or to carry children] and tie it

> the waist when they have not even examined the pregnancy the time the mother will deliver and the start to pull the chitenge and tell her lets go push lets go,"

and a woman in a different community illustrated, "some of us women like to deliver from home because our grandmothers or other relatives give us traditional herbs to deliver without much pain and faster." One woman stated that parents may also instruct their daughters on what to do regarding use of the health facility during pregnancy,

> "some parents tell their daughters not to go to the clinic so that they deliver from home in order for them to use traditional medicine and not at the clinic because there only the doctor is present and won't give them traditional medicine."

In this way, women do not appear to be traditionally the primary decision makers around health during pregnancy and birth and may have received mixed messages from family members, health workers, and clinic staff regarding what they should do during this time.

Traditional customs related to healthcare. Women and health workers across communities identified how traditional customs related to healthcare may interfere with use of health facilities during pregnancy and childbirth. There were 34 counts of this theme at baseline and 20 counts of this theme at endline. Additional categories included loss mythology, maternal silence, traditional medicine, and maternal preparation related to facility use.

Loss mythology (Inchila). Across all communities interviewed in the focus groups, women and health workers identified a non-biological cause of maternal deaths, known as inchila. Inchila was described as infidelity causing maternal death or complication during pregnancy. At baseline, this sub-theme was counted 52 times, and at endline it appeared 35 times. Some, like this woman, described inchila related to a husband's infidelity, *"*If the husband is sleeping with other women while the wife is pregnant the wife may have problems delivering

or may die. (I[N]CHILA)," while other women described it as a result of their own potential infidelity, "our parents tell us not to have another man apart from our husbands when we are pregnant because we can die (I[N]CHILA)." Still others, like this woman, described i[n]chila as a result of either partner's infidelity, and directly related it to potential warning sign symptoms during pregnancy, "it was also said that if a pregnant [woman] was feeling dizzy it was due to 'inc[h]ila' – meaning that either the woman herself or her husband had sexual relationship outside marriage after she had conceived." Health workers also discussed infidelity as a reason behind maternal death, as noted by this health worker, "I just heard the woman who died after giving birth and at last they say it's the woman who had a woman outside," and reiterated by another, "when a woman is pregnant she shouldn't sleep with another man because she is going to die when delivering."

Maternal silence. Women were described as not disclosing that they were pregnant and/or in need of assistance relating to their pregnancy by health workers and women across communities. At baseline there were 11 counts of this category and at endline there were 11 counts once again.

Homebirths were discussed as a direct result of women's reserve related to their pregnancies, as described by this health worker, "mostly when a mother is not feeling well she will not tell anyone on time she say it when it is very late hence deliver from home," and this woman in a different community, "some they don't say on time when they labor pains start." As another woman described, facility birth did not fit with cultural ideas about women's power, "they think they are strong and that those who deliver at the clinic are weak," perhaps explaining some of the reserve described related to labor. At times, maternal deaths were attributed to maternal silence related to their pregnancies, such as the case being described by this woman,

> "I also saw a woman at our community who had bleeding for many days but did not inform anyone only told the husband when it was too much and they started off for [the] clinic before they go far from home she died."

Multiple health workers and women relayed that homebirths were attributed to women's failure to share their pregnancy status or the start of contractions. One woman shared, "we don't talk anyhow because some people can capitalize on your pregnancy," suggesting certain cultural ideas around disclosure prevented women from sharing their pregnancy and/or labor needs. In a poignant statement about cultural ideas regarding maternal death, and perhaps explaining the reserve of some women, one woman relayed, "some say whether I deliver at home or at the facility when time to die has come it has come." This health worker expanded the idea of women keeping their pregnancies or onset of labor to themselves related to cultural ideals, "others it's because of traditions which they gave us to be strong not reveal fast the am [that I am] sick", when asked about why a woman may birth her child at home.

Traditional medicine. Use of traditional healers and traditional medicinal herbs was indicated as a barrier to use of health facilities during pregnancy and childbirth by both groups. At baseline there were 41 counts of this sub-theme and at endline 20 counts of this category occurred.

There were multiple accounts by both groups of maternal death as directly attributed to use of traditional healers and herbs rather than use of a health facility. One health worker relayed a story quite similar to those told by other health workers and women across communities, "me I have seen (a maternal death). They delayed to bring her to the clinic because they were going with her in traditional healers. She died from the district hospital." Health workers also discussed challenges in their interactions with traditional healers, as described by this health worker,

> "traditional healers have not changed they still administer traditional herbs which are not regulated. So they need to be sensitize because they make our work difficult. When we say traditional herbs are not good them [the traditional healer] they say no you have been bewitched and they administer the herbs when at the clinic women can be handled properly."

Use of traditional healers was also mentioned as causing maternal death in the case where women and/or adolescent girls sought abortifacients by both groups. As relayed by one woman, "they are there where a woman is impregnated and the guy refuse responsibility she will go and get herbs in the process the baby die and for her to live it is a challenge and she dies." Despite the stories relating use of traditional medicine and herbs with maternal death, women reported that they avoided the facility for birth as they would not be permitted to take traditional herbs, "we deliver from home because at the clinic nurses do not allow us take traditional herbs (lupusu)." Women described the use of traditional herbs at homebirths as believed, "to ease the pain and deliver faster this is known as (lupusu)."

Maternal preparation. Pregnant women's need to be clean and to shave prior to presenting at the health facility was discussed by both groups as a part of women being prepared for birth as related to clinician ease of delivery, cleanliness, or related to infant outcomes. At baseline, there was a count of nine occurrences of this category and at endline, it appeared three times.

Health workers reported that they instructed women to shave before arriving at a facility, such as described by this health worker, "I teach pregnant women about cleaniness, they must shave their private parts when going to deliver at labour." Women received this message across communities, as illustrated by this woman in a different area, "preparedness at nine months you

get prepared you shave so that you are clean when you go to the labor office." Other women received messages about shaving and cleanliness that they relayed were to make things easier for clinicians. As one woman stated, "women should shave their private parts when going to deliver to enable the doctor sewing stitches in case of stitches," and a woman in a different community echoed, "when you are pregnant and you come to the mothers shelter you should shave your arm pit and vagina so that there the nurses should see you with hair and the way be clear." One health worker reported a cultural tradition that reinforced the need for mothers to shave,

> "there is a tradition that says that if the pregnant woman is not cutting the pubic hair and when delivering if the baby comes in contact with that pubic hair the baby will be a fool that's what I know."

A woman in a different community relayed what she had been taught regarding the need to shave prior to facility delivery, "when a woman pregnant, she should be shaving her private part hair because may cut the skin of the baby during delivery."

Cultural barriers to accessing facility based care during pregnancy and birth were evident in the focus group data, presenting challenges across multiple avenues of women's lives. Structural barriers also emerged from the data, creating further hurdles for pregnant women to seek and receive healthcare in pregnancy and childbirth.

Structural Barriers to accessing healthcare

Individual level. At the level of the individual, structural barriers to accessing healthcare during pregnancy and childbirth were identified across groups and communities clustered around food insecurity and/or financial insecurity related to necessary birth supplies. At baseline a count of 57 barriers at the individual level were identified, and at endline a count of 46 barriers were noted.

Food Insecurity. Health workers and women with babies both described lack of food or fears about potential lack of food as a barrier to women accessing pregnancy or childbirth related healthcare. This ranged from fears around lack of food at home, potential disruption of farming and crops if the pregnant woman left home, and/or actual or assumed lack of food available at MWH. At baseline, there were nine applications of this category, at endline, a count of four applications of this category emerged.

As one health worker pointed out concerns about not having food while at a health facility may have superseded advice to use said facility for safer childbirth, "sometimes it is poverty a woman would not have food so she would think what am I going to eat? She then decide[s] to deliver at home." Multiple health workers echoed concerns around food availability both at the facility as well as for those left at home. One explained an expecting mother may not go to a facility for the birth of her infant, "lack of food at home thinking of sharing food between the family and the woman going to the mothers shelter," due to concerns around the availability of food for herself and family members left at home. Another health worker reflected on a woman who birthed at home in their community, declining facility birth due to concerns for food for her children at home, as well as food for herself. This was expressed by the following quote,

> "it happened me I was called when the baby had already being delivered. The complaint she gave was hunger she said I had no food my husband is a drunkard, for me to find food and the other children which I should have left at home, was a problem."

Women expanded on the problem of food insecurity going beyond food in the home to discuss the potential disruption of farming, from which in most cases families were obtaining their own

nutrition as well as potential livelihood, “others failing to understand what they are been advice, they fail to go to the clinic fearing to waste crops in the field.” Despite intervention sites implementing gardens at each MWH as a part of the CM effort with the intent of providing food for mothers to consume as they awaited the birth of their children, women endorsed feelings of food insecurity, when asked about why women might birth their babies at home. This sentiment is echoed in the following quote,

> “the food which is brought here to us at the mothers shelter is not enough cause there are a lot of pregnant women who are here.” One health worker echoed this concern stating, “Foot [food]. We do not have enough food for a woman to come and await delivery if she does not have enough food it is a problem.”

Supplies related to financial insecurity. Health workers and women with babies verbalized not having or being able to obtain required supplies for facility birth as a barrier to obtaining care. At baseline there were 43 applications of this category, and at endline it appeared 42 times.

Individuals discussed supplies that were required for childbirth to include things like gloves, razors (jik), soap, diapers (nappies), new clothes for the baby, new clothes for the mother, and baby blankets. At times, this lack of supplies was directly linked to the inability to financially prepare for birth, as was described by this health worker, “some women deliver at home not because they want to but because of poverty, some they cannot meet the requirements that hence feel shay [should] go and deliver at the facility when they had nothing,” and echoed by another health worker in a different community, “feeling shy to go to the facility because they did not buy clothes, napkins and requirements for the baby.”

Women with babies reiterated health worker sentiments concerning those who decline facility birth due to a lack of the required supplies. One woman discussed in particular the difficulty in purchasing new items for delivery,

> "previously most of the thing needed for delivery were found at the facility like grooves peg, jik, plastic but now starting with plastic baby clothes which should be new now they say buy everything new you buy this you buy that now when you don't have money if all these things are found at the facility most women would come to deliver from the facility. The woman just decide to deliver at home if does not have the things that are needed. The health staff should be too demanding because they want everything new even when you come clean wrappers they will still know refuse to accept."

Women confirmed the health worker's notions that women may feel shy if they do not have the required items for birth leading to homebirth,

> "sometimes it is luck [lack] of child necessities at birth which are required at the facilities from every pregnant woman. For example if you go at [the] District Hospital it is like competition by women concerning preparedness for the child birth. This give embarrassment to women who cannot manage to buy these items, they therefore decide to deliver from home."

Facility level. Women and health workers both described structural barriers at the level of the facility that may deter women from seeking care during pregnancy and childbirth. Barriers at the facility level included categories of disrespectful care provision, lack of privacy in the clinic, fear or distrust of Western medicine, male and/or young clinicians at the facility, and a

shortage of medical staff. At baseline there were a count of 83 facility level barriers and endline, 43 facility level barriers were noted.

Disrespectful care. Women with babies and health workers reported fear of disrespectful care from midwives and physicians at the health facilities as a barrier to care during pregnancy and childbirth. At baseline there were 15 counts of this sub-theme and at endline there were 10 counts of the sub-theme of disrespectful care at the facility.

Health workers explained that women may avoid the health facility if they have been unable to prepare required items for birth due to concern that clinic staff will be unkind toward them due to this lack of preparation. As one health worker pointed out, "there are some who deliver from home, for some it is because they do not prepare the requirements at the clinic. That makes them fear going to the clinic that they may be shouted at," where it is expected that women may encounter verbal abuse should they arrive without required items. Another health worker at a different site reiterated this fear of being yelled at by clinic staff, "some it is because they do not prepare the required items so they feel shy and fear being shouted at by the nurse." Health workers also indicated that women may avoid health clinics if they have not attended antenatal care early in their pregnancies, "Some women can be pregnant and register it at 7 or 8 months and they are due that same time, so they fear that the center staff will chase them," because of the concern for how clinic staff will react and treat them.

Women with babies confirmed the relationship between disrespectful clinic staff and pregnant women who are unable to prepare birth requirements declining to use health facilities. As one woman stated, "some fail to prepare themselves fully for birth, hence feel ashamed to go and deliver at the facility because they may be shouted at," and another woman in a different community echoed, "there are some who deliver from home, for some it is because they do not

prepare the requirements at the clinic. That makes them fear going to the clinic that they may be shouted at." Women with babies also described incidents of disrespectful care that they or friends had experienced in the past when interacting with the clinic staff. As one woman described, "we deliver from home at times the nurses are very rough to avoid this we deliver from home," and other woman in a different community reiterated, "some nurses are sarcastic because by then the woman is in pains then you tell her do this do that harshly. At least they should have motherly love." Women made several comments illustrating the expectation that clinic staff would treat them harshly, such as this statement by a woman discussing the importance of having family during labor as a buffer to disrespectful clinic staff, "they (family members) encourage us to push hard especially when the doctor is highly tempered." Women also recounted stories of disrespectful care that occurred when bringing their children to the clinic. For example, one woman recalled this experience in bringing her child to the clinic, "one problem here is that they open very late, instead of opening at 8 hours, they come at 10. You bring you baby and they start screaming at you." A woman in another community described a similar experience, "the baby may end up getting sick and when we take the baby to the clinic they will shout at us that you should be taking good care of your babies." In general, the relationship between clinic staff and pregnant women was recognized by participants as tenuous, with a highly skewed power dynamic, where women were not equal partners in their care.

Lack of Privacy. Participants verbalized the inability for health clinics to provide confidential and/or facilities they deemed adequate to laboring women as a barrier that prevented facility based births. At baseline, there were 18 counts of this sub-theme and at endline there were 13 counts of the sub-theme of lack of privacy as a barrier.

Women with babies discussed the physical building where labor would take place as inadequate in terms of confidentiality during labor and birth. For example, this woman specifically requests a new design for a labor room that she would find suitable,

> "we would like to see that maternity ward is in isolation at the facility. It's very embarrassing when a woman is in labor; there is lot of things during delivery. You find that patients are near then they are shouting that come from that side (maternity ward). Maternity ward has to be in isolation."

Multiple women painted a picture of crowded clinics with no confidentiality. As one woman described, "there is a provision of a small room which being shared with other patients hence pregnant mothers sleep on the floor," a woman in a different community echoed, "the delivery room is too small and we are at times shy when in labor," and a woman in another community stated, "we don't have a proper structure here for mothers when they bring us here the room is too small and its near where other patients are and you know being in labor we make a lot of noise."

Across communities health workers reinforced the lack of privacy at clinics as a barrier for women to use them during birth. As health workers noted from one community, "the labor room is not conducive that is one reason the women are shunning it" and "there is need for privacy at the labor room." In other communities, health workers noted similar concerns, "here at [clinic name] the labor ward is near the screening room and many times it is congested with people hence no privacy we are much better to deliver from home." Health workers specifically called out the lack of confidentiality as a concern across communities stating,

> "we don't have a maternity ward, the room we have is not ok, when a woman gives birth, and everyone around here is able to know because they listen to

everything happening in the labor room. It is very embarrassing for the women. We need a maternity ward in an isolated place."

One health worker suggested that the lack of privacy had driven women to decline outright to deliver at the clinic explaining,

> "here where we are seated is the room where mothers deliver from, it is near next to the place where men and women who come to the clinic sit, it is really embarrassing for our women, and they now refuse to deliver from here."

Fear/distrust of Western medicine. Fear or distrust of Western medicine in general was indicated as a barrier to women seeking/accessing clinic services across communities. Overall, women voiced fears more than health workers reported the potential for women to have fears or distrust Western medicine, but both groups endorsed this as a barrier to women seeking care during pregnancy. At baseline, there were eight counts of this category and at endline there were eight counts once again.

A fear of death was related to use of the clinic or hospital multiple times. For example when asked why some women might birth their children at home one women stated, "some is fear of unknown they think they are going to be killed at the clinic." In one community, the entire focus group of women emphasized their agreement with this statement regarding reasons why women might not use the health facility, "we turn to have fear of the unknown to go to the facility for delivery even if others advise us to start using the facility. All said yeeeeees!" A woman in a different community voiced similar concerns related to death and the facility, "I was told not to be worried and that they were a lot deaths at the hospital so I shouldn't be worried especially being at the hospital where pregnant women see a lot of deaths." Women also discussed fears related to medical testing in multiple communities. As one woman stated, "they

fear to be tested for HIV. Therefore they hoped to stay home," another woman in a different community echoed, "some women fear to be tested." Health workers confirmed the fears and/or distrust of Western medicine among community members. For example, one health worker stated, "some they fear that they are going to be referred to the hospital especially those with high parity." A health worker in a different community illustrated similar fears among community members, "some have got phobias for the clinic, especially the instruments used."

Male/young staff. Women with babies and health workers both endorsed having male clinicians or clinicians who were young staffing the clinics as a barrier to women using the facility for childbirth. At baseline, there were 11 counts of this category, and at endline there was one count.

Across communities, women and health workers specifically introduced the idea that having male midwives was problematic. As one woman pointed out,

> "me I have heard a woman was pregnant the delayed to come to the clinic she said me no I will deliver at I don't want a male midwife to see my nakedness. Women in the village are going to help me."

Another woman echoed this sentiment, "the other reason is that they fear to come and deliver in a facility because males are present and they say they cannot be seeing my private part*."* Several women combined their discomfort with male clinicians with the idea that young staff would be assisting them during birth. One woman in the focus groups attributed her friend's death to this discomfort with young, male clinicians at the clinic,

> "some of us we do not understand the importance of delivering at the facility we are stubborn even if we can be advised by many people hence my friend died fearing young nurse (male) to help her deliver her from the clinic."

Health workers reiterated this idea stating, “male midwife at the delivery room, they don’t want to be seen their nakedness” and, “some women are not comfortable with male birth attendants, so they have to deliver from home.”

Shortage of medical staff. There were multiple counts of women with babies and health workers mentioning the absence or shortage of medical staff as a barrier to use of facilities by pregnant women. Women and health workers across multiple communities echoed the idea voiced by this health worker, “we have a shortage of health workers at this facility” often using those exact or very similar words. It was expressed that the lack of clinicians was attributed to the reason for problems such as the inability of clinicians to be on call 24/7 for all of the community health needs, to care for women in labor while simultaneously caring for patients with serious illnesses, or the perceived difficulty in obtaining medicine. At baseline, 36 counts of this category emerged and at endline 11 counts became evident.

In its most extreme form, women recalled incidents where the only person available to assist in childbirth upon reaching the clinic as they had been instructed to do was a non-clinician such as a guard, gardener, or health worker. Women discussed this as becoming an issue when clinicians go on leave, such as in this community where a guard was assisting women in birth,

> “there is no way a guard can be helping mothers to deliver, and it is not ok. Mr. [Name] alone cannot manage, the time he was on leave, it was the guard doing everything so we really need a doctor here.”

One woman expressed her intent to birth her child at the clinic, disrupted by the lack of clinicians available, “even this baby was delivered from home, it was in the morning when I saw blood coming out, I wanted to come to the clinic but I was told there is no one who can attend to me.” Health workers reiterated these concerns, appealing for more clinicians,

> "shortage of midwives at the clinic contributing to SMAGs (health workers) starting delivering mothers at the clinic, there is one midwife at the facility and if she is at home it's us SMAGs helping in delivering making the baby dying because of absence of staffs. My appeal to the government is that they should give us more staffs at the clinic to be helping one another."

One health worker suggested the solution to this problem would be to increase the number of clinicians at the facility, "enough midwives so that when one is away the other is around taking care of the women because last time when the only midwife went for a workshop, there was no one to take care of the women."

Community level. Women were reported to face additional structural challenges at the level of the community as it related to accessing healthcare during pregnancy and childbirth. Structural barriers at the community level included two additional categories: 1) delays related to distance/transportation and, 2) delays related to knowledge about delivering at a health facility. At baseline, there were 102 counts of structural barriers at the community level and at endline 97 counts emerged.

Delays related to distance/transportation. Discussion about difficulty reaching a facility for childbirth or antenatal care related to how far women travel to reach health facilities was near ubiquitous across the focus group transcripts. At baseline, there was a count of 80 mentions of this and at endline it appeared 65 times. See Table 17 for a full depiction of the counts from the content analysis.

Women with babies and health workers repeatedly mentioned challenges including: the long distances that women travel as a barrier to reach the facility, problems with obtaining transport such as a taxi or a bicycle, difficulty with lack of roads or clear paths, or absence of

ambulance services. Health workers and women noted the sheer distance alone as the main barrier, as noted by one health worker, "women walk long distances of about 60km to 70km to the facility." Another health worker illustrated the issue of distance by indicating how long it took them to arrive at the health facility that day for the focus groups from their village, "some of us started off at 03:00hrs on foot from our village so that we can reach this facility at 08:00hrs." The issue of distance was compounded by additional issues that the groups identified such as transport. For example, both groups discussed transport challenges by the rainy season as exemplified by this health worker's comment reflecting on a woman who died post-partum,

> "they said she stayed 22 km away from the clinic so gave she birth on the way, she did not say earlier enough that the contraction of the pregnancy had started. And by then it was rain season so it was difficult to move due to the streams and the muddy roads so she gave birth on the way but still managed to reach the health post."

This idea was also echoed by a woman in a different community, *"*some of us we stay very there are streams where the bicycle cannot pass."

Women also described the problem of distance between their homes and the facility with the potential of delivering on the way to the clinic, "they deliver from home because some people stay in far areas, it is difficult to reach the clinic and they are scared of delivering on the way, maybe it can happen in public." One health worker recalled the loss of a woman in their community due to the inability to obtain transport to get to the clinic,

> "a woman had a lot of births and she was my client, I went to her and advice her to go early to the facility but when time came she didn't disclose to the husband early, at the end the husband started looking for transport and he managed to look

> for a wheelbarrow of which she didn't manage to sit on it until the following day when they looked for an oxcart but it was too late the woman died."

Women reiterated similar stories such as this woman in a different community, "we have heard just like others have said the husband looked for transport but did not not find it until it was too late so that woman at home died."

Lack of ambulance services or poor road infrastructure causing problems for ambulance services were also mentioned by both groups. Health workers indicated road infrastructure as a root cause in some communities, "the problem here is the road. Even the ambulance takes time to reach here. So road is the problem", in addition to challenges with ambulance services, "transportation is a big problem here at this facility because the ambulance we have works for 7 facilities," in others. Women echoed concerns related to ambulance services, "sometimes you call for the ambulance and they tell you there is no fuel, a woman can die I [as] time passes for giving birth." These concerns were reflected across various communities,

> "One of the major problems that we face here at the facility or in our community is transport to the facility and hospital when we are faced with an emergency and the road is bad that the ambulance takes time to get to the facility when they call for it."

Delays related to knowledge about delivering at a health facility. Health workers and women with babies reported varying delays in reaching a health facility that could be attributed to a lack of knowledge related facility birth. At baseline there were 22 counts of this category and at endline there were 32 counts.

Women verbalized delays related to lack of knowledge in relation to things like miscalculation of one's estimated date of delivery, the potential risks of homebirth, or the

physical manifestation of the onset of labor. One woman explained the problem of due date calculation interfering with facility birth,

> "some delay to come to the shelter they say me I take time to deliver if I go at eight months sometimes I may reach ten months I will go in the ninth month. Then she will find that she deliver in the ninth month."

Another woman noted, "some say that they always deliver at home six pregnancies this is the seventh," a woman in a different community echoed a similar concept, "others say they know how to deliver on their own." Women and health workers each identified a lack of knowledge related to the onset of labor. As one woman explained, "sometimes they are not certain if its labour pains or just abnormal pains". As one health worker illustrated,

> "some women will have stomach pains and still be seated at home saying they will go later, by delaying like that it gets worse and that is when they want to call SMAGs and yet we stay in far places for us to reach the clinic and deliver on the way."

Facilitators

Community mobilization. Domains of CM emerged as potential facilitators in creating environments that may enable women to seek care during pregnancy and childbirth. Four CM domains were specifically targeted by focus group questions: 1) collective action, 2) governance, 3) social acceptance/cohesion, and 4) social support/networks. The domain of self-efficacy emerged from the data latently. Focus group questions targeting social acceptance/cohesion and social support/networks resulted in responses from both groups that blurred the lines between these constructs. Therefore, the results from these prompts were collapsed, representing one construct named as social cohesion. The final four CM domains described in the results include:

1) collective action, 2) governance, 3) self-efficacy, and 4) social cohesion. At baseline, there were 168 counts of facilitators and at endline 333 counts of facilitators emerged. Counts of facilitators increased in intervention communities at endline, and were higher among ZaMS sites (see Table 17).

Collective action. Participants verbalized the theme of collective action, representing village activities geared toward social change, in response to the focus group prompts. At baseline, there were 78 counts of this theme, and at endline 95 counts emerged. Of note, the count among women with babies more than doubled between baseline (21) and endline (45), while the count among health workers decreased by a count of seven (from 57 at baseline to 50 at endline). At baseline there were two counts of negative or no response among women with babies and zero among health workers. At endline there were four counts of negative or non-response among women with babies and one among health workers. At baseline, negative responses (n=2) to the collective action prompt were from women in comparison communities, who suggested that although people were gathering for meetings in their villages, they were not included, as voiced by this woman, "here they meet, but they don't invite us for the meetings they just choose each other." At endline, the counts included no response to the collective action prompts by women with babies (n=3) in comparison communities, and one negative response around gathering for meetings by a health worker in a comparison community. Differences existed between women with babies and health worker responses to collective action prompts across communities, illustrating women with babies as participants of activities aimed at social change, and rarely as leaders of said activities. Yet, un-prompted in response to other questions women with babies verbalized how they were embodying collective action in their own ways.

Health workers were depicted as leading, organizing, and sensitizing communities in activities geared toward social change.

Women often recalled attending meetings that were organized around health topics. Responses to this prompt were generally short and affirmative, with little detail. For example, in response to inquiry about participation in gathering around pregnancy, childbirth or newborn care one woman replied, "in our village the SMAGs (Safe Motherhood Action Group members) came they were teaching about family planning." In many cases, women simply replied 'yes' to the prompts around collective action, with not all women in the focus group replying. In response to questions that were not geared toward a specific CM domain, women with babies in the intervention communities at endline indicated their own manner of enacting collective action. For example, when asked about what could be done to promote birth at the health facility at endline, three women in a focus group in an intervention community responded, "1) encourage them to go to the clinic, 2) tell them about the waiting shelter and its benefits, 3) visit and teach such women." In a different intervention community at endline, similar actions were voiced toward promoting facility use for birth, as explained by this woman, "when we are relaxing we share when have a woman that is pregnant that she should go to the clinic. That the shelter is good."

Health workers consistently reported participating in, organizing, and conducting meetings in their communities to provide information geared toward safe pregnancy, childbirth or newborn practices. As one health worker explained, "as the SMAGs we have the monthly under 5 on Monday we teach expectant mothers on family planning and how to keep themselves and the baby healthy." At endline more health workers in both intervention and control communities endorsed leveraging the inclusion of important members of the community to

enhance the success of their group meetings where they provided health education. For example, as this health worker stated,

> Yes, in the few past months we have as SMAGs because that's our job (organized a meeting to provide information to the community). We gather women and men together to teach them on the health of a woman, the village headman and also traditional healers to come and attend the gathering that's what we do.

Governance. Focus group discussions elicited information regarding the CM domain of governance, defined as control over group decisions and/or success in achieving goals. At baseline, there were 19 counts of this theme, and at endline 57 counts of this theme emerged. There were zero counts of non or negative responses among all sites and groups at baseline for the governance prompts. At endline, there were three counts of non-response to governance prompts among intervention site women with babies groups and two counts of non-response to the prompts among women with babies groups at comparison sites.

Women with babies response to the open-ended prompt used by identifying groups and individuals who they perceived as having control and/or influence in their communities. Primary examples of those identified included health workers, chiefs, headmen, neighborhood health committee, and health personnel. A typical response across communities included responses similar to the one found here, "Respondent 1: The village headmen and village Committee; Respondent 2: Village headmen; Respondent 3: SMAGS they teach us about health matters; Respondent 4: Village committee." Women with babies also included non-governmental organizations doing work in their communities as having influence, as described by this woman, "PLAN international, the village headman and the chiefs." Across all communities, women with babies did not name themselves in this equation of power and influence over controlling group

decisions or success in achieving goals in response to the governance prompt. Yet, women with babies did name the Savings and Internal Lending Communities (SILC) to which many of them belonged as having influence over group decisions, here described by this woman in response to the prompt, "SMAGs and SILC that is what we know."

Health workers had similar responses to those given by women with babies, regarding governance, yet they often included themselves in the list of those with influence over decisions in the community. Health workers in this community described a hierarchal structure of power and influence echoed by many other health workers,

> "Responder 1: firstly are the headmen, if there is a meeting or gathering we ask the headman to call because they fear the headman and they also contribute to for change in our health; Responder 2: the headmen has power through chiefs; Responder3: the headman has control and influence over the community, because if the community children have diseases it affects him and there will be no development in their community."

In addition to listing health workers and headmen, outside non-governmental organizations were often referred to as having influence. For example as depicted by this health worker, "apart from us SMAGs, the headmen also tell people not to be delivering at home. Those are other groups. Then we also have organizations they sensitize the communities on what is good and what is bad a practice."

Self-efficacy. The theme of self-efficacy emerged latently from the focus group questions, primarily concentrated among the women with babies groups. At baseline there were 15 counts of this sub-theme, and at endline 84 counts of this sub-theme emerged.

Women with babies described themselves in leadership positions and obtaining resources they needed to prepare for their births independent of their husbands. For example, as one woman noted,

> "I am a secretary in my group and I take part in a saving group. I mobilize the group. We seat in a cycle so that we are able to see each other. Money is lent to anyone interested and they pay back with interest. We usually share in December, so that we are able to buy farm products."

A woman in a different community verbalized how her preparation enabled her to purchase items for her baby and have a facility birth, "when you cultivated soya beans the husband would say let us be buying items needed by the ninth month you just go." Other women across communities echoed similar ways in which they were obtaining resources that they needed. As one woman indicated, "we do some piece work to acquire the resources for our babies and ourselves," and another stated, "we have to work hard and find the resources ourselves."

Women with babies portrayed themselves as the appropriate decision maker regarding where to birth one's child at endline across intervention communities. As illustrated by this woman, "women should learn that it's more important to protect their lives that [than] their marriages if husband discourages them to give birth at clinic," and echoed by a woman in a different community, "it's me. If I die my children will suffer." Multiple women relayed resisting or subverting their husband's demands about where they should birth their children. For example, as this woman stated, "some men will try to stop you, but I will go because I, feel the pain," and echoed by a woman in a different community, "It's me. {Interviewer asked if husbands can't stop them}, "My husband cannot stop me. He knows that the 'burden' he has given me will be delivered by clinic staff, unless labour starts unexpectedly sudden." Health

workers echoed the notion that women were subverting their partner's expectations about where to birth in intervention communities, "The truth is it is the woman. We have had cases where a woman come alone to the shelter [MWH] saying my husband has gone to drink beer. Us SMAGs we help her."

Social cohesion. The responses from the social support/networks and social acceptance/cohesion prompts appeared to be representing one construct rather than two. The social support/ networks construct was defined as representing perceptions of mutual aid, trust, and support. The social acceptance/cohesion construct was defined as community connectedness and working trust. Responses across both groups and time points were similar and therefore merged to represent one construct, social cohesion. This arrangement aligned more closely with what people were describing in the qualitative data in response to the prompts, revolving around community connectedness and working trust. There were 198 counts of this sub-theme at baseline, and 271 counts at endline. Women with babies voiced this sub-theme 68 times at baseline, and 146 at endline. Health workers endorsed this sub-theme 56 times at baseline and 125 at endline. Negative or non-responses to these prompts were minimal (<15) across both groups at baseline and endline.

Negative responses to the social support cohesion prompts among women with babies were centralized around discussions of borrowing money or material goods. Women endorsed difficulty with borrowing money if they did not participate in or belong to the SILC groups as described by this woman, "it is difficult to borrow money unless you belong and borrow from SILC." Negative responses to this prompt from health workers was consistently related to the fact that community members assumed that health workers were paid, especially in the cases where health workers described poor integration into the community and/or lack of endorsement

by the headmen or chiefs. Health workers described the community misunderstanding of their work as unpaid volunteers leading to difficulty in borrowing material goods. One health worker described a scenario commonly recalled across communities, “sometimes people they say because I am a SMAG they think I get paid so they find it difficult to help us SMAGs.” Health workers commonly requested items like bicycles, torches for escorting patients to the clinic at night, raincoats and boots to escort patients in the rainy season keeping their feet dry and safe from snakes.

Community support was endorsed by women with babies for things like help with sick relatives, the need to borrow money/materials for illness or funerals, and/or assisting one another to get to the health facility. As one woman described, villagers came together to create makeshift stretchers to transport those with illness to the clinic, “we do help each other if a person is sick we make amachila [stretcher] due to luck [lack] of transport then we bring the person to the clinic.” A woman in another community illustrated a similar scenario, “when you have problem like sickness, funeral they get the ox-cart and bring you to the clinic.” Women verbalized that health workers provided support as described by this woman, “we are usually helped with material things like bicycle, most help come from the SMAGs”. Health workers were repeatedly described as a key source of advocacy for women with babies during pregnancy. Endorsing health workers in her community as a key support during pregnancy acting as an interface between women, their husbands, and the health clinic, one woman stated, “even the SMAGs, when you get pregnant, when your husband is delaying you find they come and encourage you to go and register the pregnancy until the husband is influenced to go with you.”

Women with babies verbalized that they primarily sought advice or guidance regarding problems during pregnancy from family, friends, or community leaders. For example, one

woman described reaching out to other women in their community for advice regarding late menstruation, “our sisters asked them that am not having my period for three months what could be the matter they would say maybe it is pregnancy go to the clinic.” Other women echoed the fact that they could turn to family or other women, as described by this woman, “mother in laws they help in nursing the baby.” Women also described the ability to reach out to those in positions of leadership, or those at the clinic, as illustrated by this woman, “apart from our husband we also seek for guidance and advice from our leaders in the various religious groups we belong to.”

The majority of health workers endorsed feeling supported by traditional leaders in the communities in which they volunteered their time. In general, health workers discussed their communities as lending assistance to one another, as stated by this health worker, “people stand up to help when one is faced with problems.” Endorsement of the health workers by traditional leaders translated into community support as described by this health worker, “the community supports us because the traditional leaders are involved. When a woman is pregnant, they normally tell the husband to go and see the SMAGs or even her parent in law.” Health workers described themselves as being integrated into the villages such that community members would seek them in the case of illness or labor, as illustrated by this health worker, “villages support because they do inform us when a woman is sick or when labor pains start they call even in the night they come and say accompany us.”

Health workers discussed seeking advice for problems regarding pregnancy or childbirth from other health workers and from health facility staff. As one health worker described, “We go to the SMAGs and later the SMAGs they advise to go to the clinic.” Illustrating the trust between health workers, one noted, “the reason I would go to my fellow SMAG is that I cannot remove a

speck in my own eyes. I would need someone to [do] it for me, help me and advise me." A health worker in a different community echoed the sentiment that advice was sought from the facility, stating, "all the guidance we get from the clinic. Because they are the ones who can help our work." Health workers illustrated trusting relationships among health workers. For example, as this health worker stated, "the SMAG is very active they bring delivering mothers to the clinic, they spend nights here at the center until the client delivers, and this shows us that we are united as SMAG members." Health workers also illustrated scenarios in which community members were reliant and trusting of their services to support pregnant women stating things like, "the way we sensitized our community I feel happy because people now understand even at night they come to knock for and say take us to the clinic even if am a man. I bring them here until they deliver."

Aim 3 Results

The results of integration of our qualitative and quantitative analysis indicate how CM functioned within our sample in rural Zambia among health workers and women with babies. The original domains of CM under investigation by the parent study included six community focused domains: 1) collective action, 2) collective efficacy, 3) governance, 4) perceived control, 5) social acceptance/cohesion, and 6) social support/networks. The original individually focused constructs used in the analysis included two domains: 1) self-efficacy and 2) power in relationships. Following integration of the quantitative and qualitative data three community focused domains remained including: 1)collective efficacy, 2) governance, 3)social cohesion. The two individually focused domains remained unchanged: 1) power in relationships and 2) self-efficacy. The final community and individual focused domains will be explained herein,

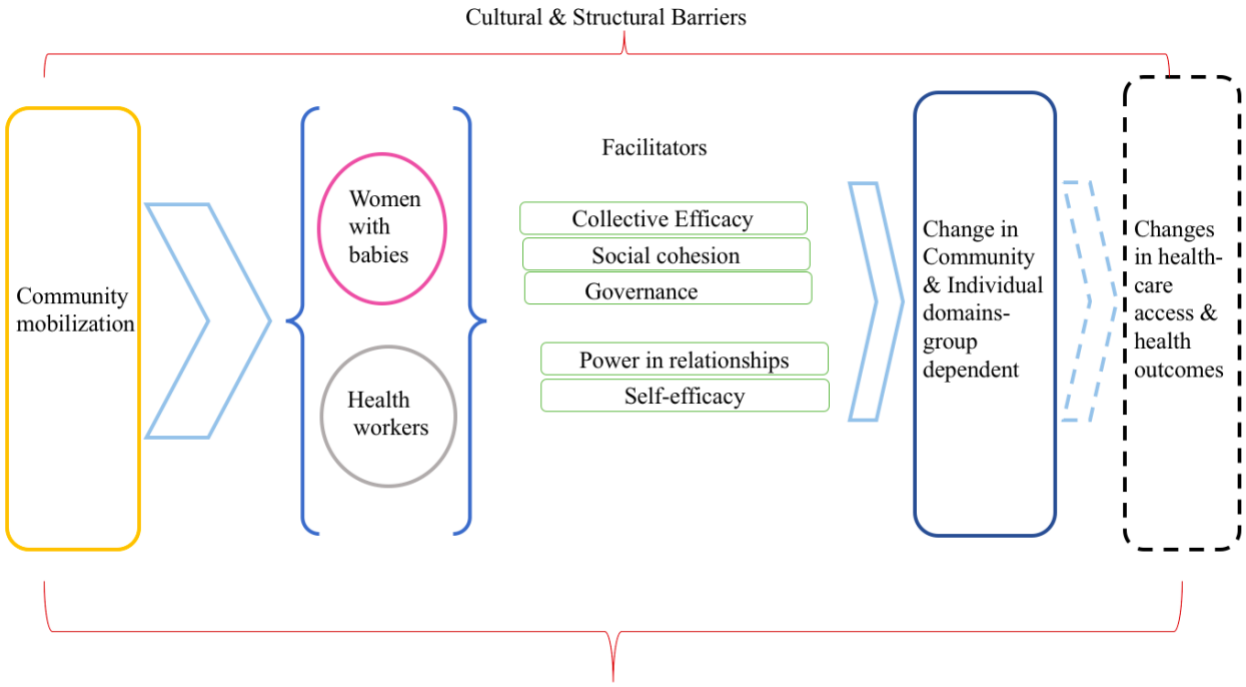
followed by a description of the figure representing how CM functioned within our sample in rural Zambia.

CM domains following data triangulation. During the qualitative analysis two main changes emerged regarding the community focused domains. To begin, the original domains of social support/networks and social acceptance/cohesion appeared to be targeting the same construct, which more closely aligned overall with the definition of social cohesion. Therefore, these two domains represented by qualitative data only, were collapsed into one domain named social cohesion. Similarly, responses to the collective action prompt in the qualitative dataset more closely resembled the domain of collective efficacy (targeted in the CM survey), investigating whether community members intervene on behalf of the common good. Similarly, according to CM research in India, "measures of women's collective efficacy measure their own perceived ability to take collective action," (Kuhlman, Galavotti, Hastings, Narayanan, & Saggurti, 2014). Therefore, the original collective action (focus group) and collective efficacy (CM survey) data were combined to represent one domain, labeled as collective efficacy. The community focused domain of perceived control was omitted following the results of the factor analysis and did not have questions included in the focus groups to analyze its pertinence in the intervention. Both individual domains (power in relationships, self-efficacy) emerged as significant in this sample, although only self-efficacy had both quantitative and qualitative data to support its impact.

Description of merged data & figure. The results of the qualitative and quantitative analyses indicate that while the CM intervention may have influenced change in the various CM domains, this impact varied across groups. Quantitative data focused on the domains targeted in the CM survey and illustrated change over time among and between sites and groups. Qualitative

data contextualized the CM intervention emphasizing barriers that impact the ability of pregnant and laboring women to access care at a facility, that were cultural and structural in nature. The qualitative data additionally explored CM domains that were directly targeted or emerged latently. Community and individually focused CM domains were illustrated as facilitators in promoting access to care for pregnant and laboring women. Evidence of differences between groups regarding barriers (cultural and structural) and facilitators (CM domains) to pregnant and laboring women accessing care indicated that women with babies and health workers experienced the intervention and its impacts differently. See Figure 11.

Figure 11. Depiction of merged data



Specifically, our merged results reflect how barriers may have influenced the CM intervention. For example, we consider the barrier described as traditional gender roles in the focus group data and how that may have influenced our merged results. For three of the CM domains (self-efficacy, collective efficacy, governance) with CM Survey data available, the

mean scores representing women with babies were lower in comparison to health workers or community members. These results were statistically significant at the level of $p<0.001$ for the domains of self-efficacy and collective efficacy and significant at the level of $p<0.05$ for governance. The individually focused CM domain of power in relationships did not reflect this impact as statistically significant, yet did indicate that as the number of living children increased, the mean score for this domain decreased, significant at $p<0.05$. See Tables 7-14 to review the results of our quantitative analyses.

Triangulation of the survey results with the focus group data also reflected the potential influence of traditional gender roles, indicated as a barrier to women accessing healthcare during pregnancy and birth in our qualitative data. For example, concerning the domain of governance, where women with babies had lower mean scores than other groups (as noted above), we identified that women consistently left themselves out of the equation of control in communities in the qualitative data. In contrast, health workers described similar people they considered to be in control as illustrated by the women with babies, yet did include themselves as a part of those influencing and having control in the community. A similar pattern emerged in the collective efficacy data where women with babies had lower mean scores than health workers and also described themselves as participants in group meetings and activities rather than organizers whereas health workers illustrated themselves as doing both.

Reflecting on the domain of self-efficacy, which emerged latently in the focus group data and was specifically targeted in the survey data, a different pattern surfaced. Here, the survey data once again indicated higher mean scores for health workers when compared to women with babies. Yet, in the focus group data where the domain of self-efficacy emerged latently, a contrasting image arose. To begin, at endline, women with babies had higher counts of the self-

efficacy factor in the content analysis. Furthermore, women with babies described themselves as subverting traditional gender roles related to things like control over decision making about place of delivery, described themselves as leaders, and discussed how they were obtaining resources they needed for birth independent of their husbands either on their own or as a part of a collective in their communities.

As depicted in Figure 11, our merged data suggested that structural and cultural barriers to accessing care such as traditional gender roles, influenced various groups in divergent ways leading to group dependent differences in the individual and community focused domains both prior to, throughout, and following the CM intervention from our sample in rural Zambia. Although untested in our results, as depicted using dashed lines in our figure, we hypothesize that group dependent changes in the CM domains would have potential impact on changes in health care access and outcomes, which themselves would also be group dependent and influenced by cultural and structural barriers. Rather than indicating increases in all of the domains per our investigator derived CM Theory of Change (ToC) (Figure 1), our figure representing the merged data suggests changes will occur in the domains, without qualifying said changes.

The results of our merged data highlight the implications of cultural and structural barriers in the design, implementation, and outcomes of CM interventions lacking in our original investigator designed CM ToC. While taking into account the larger context of cultural and structural barriers, our figure representing the merged data did not specifically acknowledge the impact of the SGML legacy districts. In our investigator designed CM ToC, we depicted the ideal outcomes from the legacy districts and CM resulting in improved quality of care. Yet, the voices of individuals living in legacy districts in our sample illustrated structural challenges that

remained such as disrespectful staff, clinician shortages, and care provision that was not culturally congruent with the communities being served, despite intense effort put forth during the SGML campaign (Conlon et al., 2019). The CM domain changes suggested in the figure representing the triangulation of our data (Figure 10) imply these changes are dependent on cultural and structural realities, thereby emerging differently across groups based on the context in which the CM intervention occurs. Where our original CM ToC suggested that CM would improve health equity in rural Zambia, the figure representing our merged data suggests that CM has potential to improve health equity, but will certainly reveal persisting inequities post CM intervention.

Chapter 5 : Discussion

Based on our data from two districts in rural Zambia, it is clear the CM intervention had impact at the level of the community and the individual among the domains of governance, social cohesion, self-efficacy, and power in relationships. Our data reflect that CM interventions function and have impact in different ways for different groups even within the same community, with the most marginalized members perhaps receiving the least benefit. However, conclusions regarding this must be interpreted with caution as the parent study did not employ the CAC in their CM intervention nor target women directly as stakeholders in addressing high rates of maternal mortality in their communities.

There were significant demographic differences found between ZaMs and comparison sites at baseline, but none were statistically significant at endline. People reported having lived in comparison sites four years longer than intervention sites at baseline ($p=0.01$), which may have impacted our results via increased social bonds that may have impacted responses to the CM survey. At baseline there were more unmarried people living in ZaMs sites and people in ZaMS sites reported having completed more formal education than those living in comparison communities. It is important to consider the impact of the statistically significant difference ($p=0.006$) in participant's report of formal education at baseline, with ZaMs sites reporting more completion of formal education than comparison sites. The connection between higher levels of education and increased use of reproductive health services has been consistently documented in the literature (Stephenson, Baschieri, Clements, Hennink, & Madise, 2006). In Zambia

specifically, results of the 2018 Zambian Demographic Health and Survey Data (DHS) positively correlated higher levels of education with higher levels of wealth, increased likelihood of skilled assistance at delivery, and facility birth (Central Statistical Office [CSO] {Zambia}, 2018). Although at endline there were no significant demographic differences between the ZaMs and comparison sites, more people with a higher level of formal education in the ZaMS sites at baseline may have influenced the success of the CM intervention and the overall results of our secondary analysis. However, as the data collection only included three categories (none, some or all primary, and some or all of secondary or tertiary) it is unlikely that this had a great impact on the intervention or results.

Our factor analysis reduced the original proposed six factor structure of the CM survey to a four factor structure, representing the CM domains of: 1) collective efficacy, 2) governance, 3) self-efficacy, and 4) power in relationships. The CM domains of perceived control and social acceptance/cohesion were eliminated from the CM survey. We hypothesize that the domain of perceived control was inappropriately evaluated for three main reasons relating to altering the original survey items, ethnocentrism, and gender dynamics among our sample. This domain was operationalized using three items pertaining to satisfaction concerning control over group decisions, two of which targeted the individual level of psychological empowerment, and one the community level of psychological empowerment (Israel, Checkoway, Schulz, & Zimmerman, 1994). The original scale development sought to operationalize three levels of psychological empowerment (individual, community, organizational), suggesting that if all three levels were present this represented manifestation of Freire's concept of conscientization (Israel et al., 1994). Choosing only a few of the items operationalizing individual and community levels of empowerment (omitting the organizational level) from the original Israel et al. (1994) scale and

altering the items for the research in rural Zambia, may have impacted the ability of these items to load properly. Furthermore, the CM intervention in the parent study did not use the Community Action Cycle (CAC) as a part of their intervention, a suggested key ingredient in developing conscientization (Costello, 2018; Howard-Grabman, 2007). The absence of the CAC may have impeded the intervention's ability to invoke the development of conscientization, therefore a domain such as perceived control, may have been unable to properly measure its target. It is also possible that failure of the perceived control items to load represent an artifact of ethnocentrism, as their original development occurred in the United States, and may not have been interpreted congruently in the rural Zambian context or been representative of something culturally relevant (Israel et al., 1994; Romero, Wallerstein, Lucero, Fredine, Keefe, & O'Connell, 1999).

Finally, the demographics of our sample included a disproportionately higher number of women (395 women/198 men at baseline, not collected at endline, see Table 8). Taking this into account when reviewing our survey results suggests the perceived control items may not have been properly evaluated in our sample from the perspective of gender norms. Participants in the focus groups did not verbalize expectations of women being in control or making decisions that controlled others in the community due to community and social norms in Zambia. The identification of a patriarchal structure in our data aligns with what was identified in the 2013-2014 Zambian Demographic Health and Survey (DHS) data, where 73.4% of men were identified as head of household, with those male-headed households having more economic stability than female headed-households (CSO, {Zambia}, 2014).

The social acceptance/cohesion domain was also eliminated from the CM survey following factor analysis. This domain included one question on the CM survey, "I think my

community is a good place to live." Defining a factor in a factor analysis requires at least three items, and removal of this CM domain may have been an artifact of this general rule (Pett, Lackey, & Sullivan, 2003). It was expected the social acceptance/cohesion item may have clustered with items relating to another domain on the CM survey, yet it did not conceptually fit in any of the iterations attempted. Despite removal of the CM domain of social acceptance/cohesion from the CM survey, our qualitative data provided an avenue through which its relevance was holistically explored in our rural Zambian sample. Interpreting the social acceptance/cohesion domain alongside the social networks/support domain we identified these two domains were targeting one construct in the qualitative data, more closely aligned with the social acceptance/cohesion domain.

Social cohesion has been uniquely identified by researchers as relevant in the African context through content validity for HIV prevention programming, defined in the community capacity literature as social relationships centered around connectedness, trust, and sense of community (Lippman, Maman, Macphail, Twine, & Peacock, 2013). We hypothesize the lack of distinction between the social support/networks and social acceptance cohesion domains existed as an artifact of the focus group questions having been developed outside of context, potentially lacking distinctive nuance for the participants in our rural Zambian sample. Combining the two domains, social acceptance/cohesion remained relevant in the CM intervention in rural Zambia, with health workers identified as key advocates for pregnant women. Health workers have been identified as especially valuable in providing linkages between formal health institutions and communities due to their knowledge of local context and priorities (Howard-Grabman, Miltenburg, Marston, & Portela, 2017). Focus groups in Zambia have previously illustrated

health workers as integral in supporting pregnant women to obtain facility based healthcare (Serbanescu et al., 2019).

Patriarchal gender norms were illustrated in both forms of data. Participants identified in the focus groups identified men as primary decision makers in the private and public sphere. For example, participants described a system where women faced punitive fines from chiefs for homebirths yet often lacked support from the larger cultural system or their husbands (financial or otherwise) to birth their children at facilities. This type of double bind has been described in the literature elsewhere suggesting that women don't necessarily choose riskier options for birth, but rather face limited options to choose from given structural constraints (Kyomuhendo, 2003). Regarding the domain of social acceptance/cohesion, women with babies described reaching out to friends, family, and health workers for support; whereas health workers identified access to more formalized institutional level support. A main purpose of CM interventions is the development of conscientization which builds an avenue through which women or marginalized groups can more easily access and influence structural systems (Costello, 2018; Howard-Grabman, 2007). The absence of the CAC in the parent study's CM intervention may have influenced women's use of institutional sources of support beyond health workers or belief that they could approach institutional systems for support.

Focus group data provided an avenue to better understand the setting in which the CM intervention occurred. Cultural barriers, including traditional gender roles and traditional customs related to healthcare were identified by women and health workers as impactful in inhibiting facility use by pregnant and laboring women in our sample. Traditional gender roles were illustrated in our sample as patriarchal, with outside authorities such as chiefs, husbands, or other family members influencing women's ability to seek facility based healthcare. Research in

Malawi supports the findings in our data that traditional gender roles with men as decision makers had negative implications for their partner's ability to obtain facility based care for birth (Mwanda-Taylor et al., 2017). This is also congruent with research from Mali identifying women were heavily influenced by the preferences and opinions of their mothers-in-law in relation to antenatal care and facility birth (White et al., 2013). Women and health workers in our sample described traditional gender roles around child rearing as preventing women from accessing facility based antenatal and birth services. This finding is supported by research in Tanzania, Ethiopia, Malawi, and South Africa where traditional gender roles positing women as caregivers and men as income generators limits women's ability to meet various health and social needs for themselves and their children (Ely et al., 2015).

Identification of cultural influences around the theme of traditional customs related to healthcare was also discussed by women and health workers in our sample. Cultural customs related to maternal stoicism or silence related to pregnancy and birth were noted in our sample by health workers and women. Similar findings have been documented elsewhere, such as in Uganda, where a birthing culture esteems women who birth unaided without complications, labels those who have complications or surgery as 'lazy', and normalizes death as part of pregnancy and a woman's path should it occur (Kyomuhendo, 2003). Women and health workers in our sample in rural Zambia identified a cosmological, fate driven cause of maternal mortality suggesting a worldview which may hinder facility use. These cosmological interpretations of pregnancy and birth as well as the idea of women being strong in relation to birthing alone have been well documented across sub-Saharan Africa in various communities and cultures (Lang-Baldé & Amerson, 2018). Use of traditional healers or herbs were also discussed by participants in our sample as barriers to facility use. Cultural practices such as use

of traditional healers or herbs was linked to a decreased likelihood of facility use by our participants. Use of traditional healers across sub-Saharan Africa is provided through culturally meaningful personal and social interpretations of health and illness and thought to be relied on in part because of its deep connection to the community in relation to birth (Lang-Baldé & Amerson, 2018). Gamlin and Hawkes (2015) had similar findings in their research among indigenous women in Mexico, yet questioned the interpretation of women birthing without a skilled attendant or use of traditional healers as fatalistic or cosmologically driven. Rather, they suggest these customs are physical manifestations of structural violence embodied through the experiences of extremely marginalized women (Gamlin & Hawkes, 2015). Community mobilization interventions draw on strengths of the community that are culturally relevant, which can begin to address these kinds of barriers to care in meaningful ways (Howard-Grabman, 2007).

Structural barriers were described at the individual, community, and facility level which may have prevented women from seeking care during pregnancy, several mirroring previous findings in the literature. Individual level barriers included food and financial insecurities. Food insecurity has been described as influential in the decision to use facilities, including those with adjacent MWHs for birth (Chibuye et al., 2018; Lori et al., 2013). Financial insecurity and or cost prohibitiveness have also been described in the literature as decreasing the likelihood of facility based deliveries (Moyer & Mustafa, 2013). While facilities alone are unlikely to be able to address the issue of food and/or financial security, adjacent MWHs may offer solutions. The implementation of MWHs continues to evolve with current models investigating the acceptability of various food sources and food sources as income generating activities for women (Coley et al., 2019). Qualitative research in rural Zambia indicated that women would even be

willing to pay a small amount (5 kwacha or $0.92 U.S.) to stay in a MWH prior to birth, given the provision of high quality services, described to include food (Vian et al., 2017).

At the facility level, participants in our sample described disrespectful care as a deterrent to use of health facilities by pregnant and laboring women. Studies in West and sub-Saharan Africa have illustrated that when attitudes and the behavior of clinic staff are perceived as negative, abusive, or disrespectful, women are less likely to seek facility birth (Faye et al., 2011; Kyomuhendo, 2003; Moyer & Mustafa, 2013). Echoing a study conducted in Senegal, women and health workers in our sample described male midwives at the clinic as a deterrent to their use (Faye et al., 2011). Additional reasons preventing use of health facilities by pregnant and laboring women described by our participants included shortages of medical staff and distrust and fear of Western medicine, both of which have been previously documented in the literature (Kyomuhendo, 2003; Moyer & Mustafa, 2003). Lack of privacy at health facilities was previously identified in rural Zambia as a reason why women may choose to birth outside of the clinic setting and was mirrored in our qualitative data (Chibuye et al., 2018). At the community level delays related to distance or difficulty with transportation that prevent facility use illustrated by our participants have been long documented as problematic in preventing facility based birth (Thaddeus & Maine, 1994; Moyer & Mustafa, 2003).

Across the factors of collective efficacy, self-efficacy, and governance our survey results mirrored focus group depictions of patriarchal gender norms among our sample as women with babies consistently had lower factor scores than other groups. These findings reflect the exact presumptions that drives the use of CM in marginalized communities, where it is assumed that women hold less power than others, impacting their ability to take care of their health needs (Howard-Grabman, 2007). For the governance factor, women with babies had statistically

significant lower mean scores when compared to health workers ($p=0.04$) with decreased scores approaching significance when compared to community members ($p=0.06$). Focus group data echoed these quantitative results, as women with babies left themselves out and were left out by others in describing those who had power and control over group decisions in the community. Manifestations of gender inequity such as these have been reflected in other studies using CM, illustrating how women's low social status influences everything from community priority setting, to household decision making, to the participation of women in CM interventions not directly targeted toward them (Howard-Grabman, et al., 2017).

The self-efficacy and collective efficacy domains had survey results discordant with focus group results at endline among intervention communities. Similar to the governance factor, the women with babies group mean scores for the collective efficacy factor were significantly lower than community members ($p<0.001$) or health workers ($p<0.01$). Yet, within intervention communities at endline, women with babies reported enacting collective efficacy in their own way by promoting facility use for birth in their communities. The self-efficacy factor reflected the same pattern. The women with babies group mean factor scores were significantly lower when compared to community members ($p<0.001$) and health workers ($p<0.001$). Yet, in our focus group data women with babies in the intervention communities at endline illustrated themselves as leaders and decision makers, innovatively obtaining resources they needed to birth in a facility. One interpretation of the discordance in our quantitative and qualitative data is that despite the patriarchal norms that may have prevented women with babies from participating and benefitting as fully as other groups in the CM intervention, our qualitative data reflects CM's nature as a process. Rather, despite a reflection of larger patriarchal social norms in our

quantitative data, our qualitative data indicated that women with babies were receiving some benefit from the intervention even if it was not quantitatively significant.

Thinking along this continuum, when CM interventions are not directly targeted at marginalized groups, these individuals may gain benefit at slower rates than other groups as they are operating within larger systems of oppression. A three year intervention and three year evaluation may not be enough to fully capture change processes that are happening slowly within the most marginalized groups. In a review of effectiveness studies identified through systematic literature reviews of community participation interventions, multiple studies emphasized the importance of creating opportunities for women and other marginalized groups to develop leadership skills and the creation of enabling environments in which they could actively participate in changing issues that directly impact them (Howard-Grabman et al., 2017). It is possible that because the parent study's CM intervention did not specifically target women with babies or use the CAC, the group dependent changes in our quantitative results are a reflection of largely static gender and social norms.

Increasingly there is a call to incorporate men and other influential family members across maternal and child health interventions in sub-Saharan Africa, in part due to patriarchal gender dynamics where women often lack equitable power (White et al., 2013). Yet, CM interventions specifically targeting extremely marginalized women have had substantial improvements in health outcomes without relying on the incorporation of men or traditional power holders in the community (Saggurti et al., 2019). At times, this strategy of targeting extremely marginalized groups has resulted in conflict due to the emergence of these group's activities or behaviors challenging social norms (Howard-Grabman et al., 2017), yet researched longitudinally these negative outcomes have been shown to dissipate (Schuler & Nazneen,

2018). Research in India evaluated the effects of CM to investigate whether it affected the interactions between women and healthcare providers, in turn affecting the health system at large (Hay et al., 2019). Findings suggested that women from CM intervention areas (that used the CAC specifically targeting women) had significantly higher self-advocacy with their healthcare providers and a higher likelihood of, "confident navigation of health services from baseline to follow-up," (Hay et al., 2019, p. 9). Furthermore, these women had an overall increase in health service use and a higher likelihood of reporting the receipt of respectful, high quality care suggesting that the processes involved in CM are capable of changing the ways in which marginalized groups interact with the health system, disrupting harmful social and gender norms (Hay et al., 2019).

Bivariate analyses and ordinary least squares regression were used for each of the factors remaining post factor analysis to assess for change over time and differences among the groups following the CM intervention. The community focused domain of governance ($p=0.01$) showed higher mean scores in the comparison communities at endline. It is possible for this domain that the construct being evaluated was either inappropriately targeted or irrelevant to this CM intervention. Another possibility includes the lack of a CAC in this CM intervention, which potentially distilled the possibility of the emergence of key CM domains due to lower potential for conscientization (Costello, 2018; Howard-Grabman, 2007). A recent randomized trial of CM using a version of the CAC versus an Mhealth intervention in India found that although Mhealth raised awareness, only the CM using the CAC changed disease outcomes among those with type 2 diabetes (Fottrell et al., 2019).

Another possibility is explained by the diffusion of innovations theory, where comparison communities may have begun to experience increases in various CM domains due to a spillover

effect of the intervention into their communities (Dearing, 2009). Diffusion of innovations theory suggests that new ideas or processes will be communicated through certain channels within social systems over time, which can be accelerated or slowed via specific mechanisms (Dearing, 2009). In a peer intervention for HIV prevention among adults in rural Malawi, improved psychosocial outcomes targeted towards HIV prevention were reported by non-participants in the intervention communities, suggesting a diffusion effect (Crittendon et al., 2015). It is possible that the effects of the CM intervention were diffusing into comparison communities over the three year period, but more research testing the diffusion of innovations theory among CM interventions is needed.

The self-efficacy factor showed statistically significant higher scores at endline in intervention communities, with interaction effects between time (baseline to endline) and site (intervention vs comparison) showing all of the increases in the self-efficacy factor isolated in the intervention communities ($p<0.001$). The individual domain of power in relationships showed a significant ($p<0.001$) increase in scores from baseline to endline, with intervention communities showing a significant ($p<0.001$) decrease in scores. The kinds of questions used for the power in relationships factor in the CM survey represent what is considered typical questions that are used to understand women's perceptions of skill in controlling behaviors, including condom use, to measure the construct of self-efficacy (Albarracin et al., 2004). Therefore, this outcome for the power in relationships factor unsurprisingly aligned with the self-efficacy factor score results, with intervention communities showing the most change toward increased self-efficacy and increased power in relationships. Intervention communities had less people who reported 'yes' answers to the power in relationships questions exploring conflict around condom use negotiation with partners, meaning individuals reported more ability to control negotiation of

condom use. This could be related to the collective focus that CM interventions provide having a simultaneous impact or synchronistic relationship with individual-level changes.

The emphasis in CM interventions is not traditionally on changes at the individual level with successful CM interventions reported to benefit from longevity when communities begin to focus away from individual responsibility and toward the collective effort (Howard-Grabman, et al., 2017). Collective empowerment, a goal of CM interventions, has a contested and unreliable relationship to individual empowerment that is highly contextual and situation specific (Gram et al., 2018). Yet, communities are composed of individuals experiencing varying degrees of power and influence due to social norms, and understanding how community processes impact the individual may provide an avenue through which CM interventions could demonstrate impact in a more standardized way but would have to be approached with caution. Self-efficacy has frequently been used as a proxy to measure women's empowerment (Gram et al., 2018; Schuler et al., 2010) and is suggested as a possible measure of psychological empowerment (Zimmerman, 1995). Use of self-efficacy as a proxy for empowerment could be useful in further evaluations of CM, yet researchers caution against interpreting output that is objectively driven (by the researcher's interest and framing of questions or survey items) (Gram et al., 2018).

The findings from our secondary analysis of a CM intervention in rural Zambia did not result in a new way to measure this complex, process oriented, empowerment based intervention. Yet our findings were meaningful in that they highlight the importance of developing a consistent definition of CM that argues for use of the CAC and targeting of the groups experiencing the highest discrepancy in poor health or social outcomes for the sake of meaningful subversion of harmful norms. Further mixed methods research is needed to continue to comprehensively understand how and where change occurs in process interventions, such as

CM, in order to provide holistic evaluations is an avenue that can continue to provide more depth and provoke meaningful next steps (WHO, 2017).

Limitations

This study has many limitations. We acknowledge that the entirety of the CM survey was comprised of questions generated for and tested among Western populations, challenging our results due to ethnocentrism, even among those domains that remained salient following the factor analysis. The collection of participants biological sex (and no collection of gender) only at baseline prohibited us from completing a thorough gendered analysis. Furthermore, data collection was completed by research staff of both sexes When possible, women with babies groups worked with female staff, yet this was not always possible and likely influenced the outcome of our results.

Turning toward definitions of CM to suggest that they include the CAC or a close participatory action type variation of the CAC and specifically target the marginalized groups whose health outcomes are of interest may improve clarity regarding reporting on outcomes. Yet, measurement of CM may continue to prove challenging due to the variability and contextual nature of these interventions. Use of individual level constructs should be used with caution as they may reflect more on the researcher's objective interests than the participant's subjective interests (Gram et al., 2018). Adapting previously validated measures of CM (Lippman et al., 2016) has been suggested as a potential way to evaluate and measure a collective women's empowerment, with women living within a specific area identified as the community under evaluation (Gram et al., 2018). Another possibility for the evaluation of CM interventions at the individual level includes use of the Relative Autonomy Index, derived from Self Determination Theory (Gram et al., 2018). This measure has been previously used to evaluate the impact of CM

interventions using the CAC on women's empowerment among women in rural Nepal (Gram et al., 2017), in addition to use in forming the Women's Empowerment in Agriculture Index which has been put to use in Bangladesh, Ghana, and Nepal (Gram et al., 2018).

As a secondary analysis, we did not have control over the issues of priority, implementation, or integration regarding our concurrent mixed methods approach. Both forms of data were collected in parallel thus, did not inform one another iteratively, as is the case with exploratory or explanatory sequential designs (Fetters et al., 2013). The issue of priority was taken into account by the parent study, with the focus group and survey data given equal weight (Ivankova et al., 2006). The issue of implementation was also decided by the parent study, with quantitative and qualitative data collected together (CM survey was collected with focus groups immediately after with the same participants) (Ivankova, et al., 2006). Finally, integration of the data did not occur in the beginning of the study to assist with formulation of purpose, nor the middle to guide data collection, rather was interpreted/triangulated after all data were collected, as is common with convergent mixed methods designs (Fetters et al., 2013; Ivankova et al., 2006).

Chapter 6 : Conclusion

Nursing is well positioned to investigate the impact of CM interventions due to the alignment with the International Code of Ethics which insists on, "advocacy for equity and social justice in resource allocation, access to healthcare, and other social/economic services," (International Council of Nurses, 2012, p. 2). Addressing persistent problems, such as maternal mortality, requires multifaceted solutions such as CM coupled with MWHs and health facility strengthening, yet reporting and evaluation is a continued challenge. Nurse scientists must continue to expand and explore community engagement strategies, interventions, and evaluation approaches to develop and implement meaningful, impactful research. Without the perspective of all groups, including those who are most marginalized, the disruption of structural inequities leading to poor health outcomes is far less possible.

The Every Woman Every Child (EWEC Global Strategy) Global Strategy for Women's Children's and Adolescent's Health (2016-2030) has three main calls to action: 1) survive (end preventable deaths), 2) thrive (ensure health and well-being), and 3) transform (expand enabling environments) building on the Sustainable Development Goals agenda (WHO, 2017). There is a known lack of research around the areas of community participation, social accountability, and those that specifically address gender inequities (WHO, 2017). Expanding the use of CM interventions provides an avenue to address the EWEC Global Strategy as well as Sustainable Development Goals # 3 (good health and well-being) and #5 (gender equality) (United Nations, 2019). Directly targeting women or other marginalized groups or including groups who hold power in communities is a choice that CM researchers must make. Results may appear to emerge

more quickly relating to health outcomes when more powerful groups are involved in CM interventions, yet it is necessary to question whether this strategy will subvert harmful social and gender norms in quite the same way, if at all. Measurement of CM interventions can rely on validated instruments such as the Relative Autonomy Index to capture changes in empowerment in individuals or the use of measures of CM previously validated in settings similar to the one in which the research will occur (Gram et al., 2018). Studies employing mixed methods will continue to add value to CM intervention research due to the complex and context specific nature of these interventions(Beck et al., 2018; Howard-Grabman, 2007; Howard-Grabman, Miltenburg, Marston, & Portela, 2017; WHO, 2017).

Future Directions

Failure to scale up CM interventions due to criticism about the inability to pinpoint the exact mechanisms driving successes is paramount to neglecting use of medical interventions without precise mechanistic understanding (Costello, 2018). The latter is considered unacceptable, and yet despite well documented evidence that CM has significant impact on the reduction of neonatal and maternal mortality in low- and middle-income countries (LMICs) (Prost et al., 2013), and influence on quality of care and responsiveness of health systems (Hay et al., 2019; Howard-Grabman et al., 2017) there has been a lack of proper investment in CM approaches for scale up. Continuing to build the research base for use of CM is vital to expand the use of this strategy for the improvement of maternal and child survival in LMICs, and should continue to be explored to address other complex health and social problems (Costello, 2018; Howard-Grabman et al., 2017).

Researchers in India have shown that CM has significant impact on the prevention of type II diabetes in a rigorous cluster randomized trial of 2,740 individuals (Fottrell et al., 2019). Initiation of CM interventions should be swiftly tested further in LMICs to meet the rising tide of

chronic disease (Naghavi et al., 2017; WHO, 2008). Consideration should be given to testing CM for issues such as the maternal mortality crisis in the United States and chronic diseases including heart disease, diabetes, and addiction. Testing adaptable models in the United States and other high income countries will be important, including the use of technological platforms to facilitate the convening of meetings for the community action cycle (CAC). Although some in person meetings may be important, the CAC may function differently (and well) in the United States through use of a hybrid model that makes use of the technologies available and already widely used.

Simultaneous health systems strengthening has shown improved health benefits in CM interventions when compared to CM alone (Colbourn et al., 2017) In addition, CM among marginalized women in India showed that women who participated in the intervention had a positive impact on the quality of care that they received when interfacing with health systems (Hay et al., 2019). Innovative creation of space for equitable dialogue between health systems and communities they serve has begun to emerge through strategies that build on the successes of CM interventions, such as the social accountability approach using Cooperative for Assistance and Relief Everywhere's community scorecard (Gullo et al., 2017). Amplifying these kinds of innovations and further use of CM holds power and potential to increase the delivery of high quality care while mitigating health inequities directly linked to oppressive structures. Future research should continue to explore the impact of simultaneous health systems strengthening and CM interventions in addition to the impact on quality of care. These kinds of dual interventions should be designed using a gender transformative lens to amplify the potential for disrupting harmful social and gender norms on a broader scale (Hay et al., 2019).

The health and social implications of widespread implementation of CM approaches have great potential to address the EWEC Global Strategy's mission, yet supportive policy and political

will are necessary to unlock these achievements. Policymakers can create space for these interventions by supporting and listening to the existing community groups in their jurisdictions with the help of social scientists and health services researchers analyzing which groups are active, meeting on a regular basis, and how they are functioning (Costello, 2018). Exploring how these groups could be bolstered through use of CM and the CAC through mixed methods or qualitative research could accelerate the development of unions of political action and social evolution (Costello, 2018). Research funding could support these efforts through increased calls for community engaged research, including CM, intrinsically geared toward advancing health equity.

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Appendices

Appendix A-1

Demographic and Individual Survey for Zambia

Date:_____
District:_____
Community Health Center:_____
Type of Group (check one):

- Women with babies less than 2 year old
- Community members
- SMAGS/health workers

Hello, I am and will be reading the questions in this interview. Let me remind you that we will not share your answers with anyone and you can skip any questions you do not want to answer. Do you have any questions?

1. How long have you lived in this (your) community? _____(years)

2. How old were you at your last birthday? _____(years)

3. What is your marital status? (Check answer)

   - Married/in union [0]
   - Widowed [1]
   - Separated or divorced [2]
   - Single [3]

4. How many living children do you have? _____(number)
5. Education **(check the highest level of education completed)**:

   - (0) = No education
   - (1) = Lower primary (1-4)
   - (2) = Upper primary (5-7)
   - (3) = Junior secondary (8-9)

- (4) = Senior secondary (10 – 12)
- (5) = Tertiary

Please answer (circle) NO or YES to the following questions:

6.	I am often a leader in groups.	N0 = [0]	YES = [1]
7.	I find it very easy to talk in front of a group.	N0 = [0]	YES = [1]
8.	I can usually organize people to get things done.	N0 = [0]	YES = [1]
9.	I think my community is a good place to live.	N0 = [0]	YES = [1]
10.	I believe that a community can talk about the issues that involve them freely among themselves.	N0 = [0]	YES = [1]
11.	I believe that a community can hold group meetings to talk about issues that involve them.	N0 = [0]	YES = [1]
12.	I believe that a community can work with current community groups to deal with issues that involve them.	N0 = [0]	YES = [1]
13.	I believe that a community can have a say in changing the conditions that involve their lives.	N0 = [0]	YES = [1]
14.	Using a condom every time I have sex would make my partner angry.	N0 = [0]	YES = [1]
15.	Using a condom every time I have sex would make my partner think I don't trust them.	N0 = [0]	YES = [1]
16.	Using a condom every time with my partner would make my partner not trust me.	N0 = [0]	YES = [1]
17.	I believe that a community can get resources to change things that involve them.	N0 = [0]	YES = [1]
18.	I can influence the decisions that this group makes.	N0 = [0]	YES = [1]

19.	This group has control over decisions that involve my life.	N0 = [0]	YES = [1]
20.	This group is successful in achieving its goals.	N0 = [0]	YES = [1]
21.	I am satisfied with the amount of change I have over decisions that this group makes.	N0 = [0]	YES = [1]
22.	My community has influence over the choices that involve my life.	N0 = [0]	YES = [1]
23.	I can control decisions that involve my community.	N0 = [0]	YES = [1]
24.	I feel good with the amount of control I have over decisions that involve my community.	N0 = [0]	YES = [1]

Appendix A-2

Focus Group Questions for Zambia

Date:_____

Facilitator:_____

Note taker:_____

District: _____

Community/Health Center: _____

Number in attendance (not including Africare staff):_____

Type of Group (check one):

- Women with babies less than 2 year old
- Community members
- SMAGS/health workers

Now we are ready to get started with the focus group. I will be the moderator today. This is _____ and s/he will be taking notes and keeping us "on time". We will be meeting for about 60 minutes. We are going to use a tape recorder so we do not forget the important things you tell us. Is that OK?

You have been invited to join a focus group with community members. This focus group is an interview, conducted by a trained moderator from Africare. The interview is conducted in a natural way, much like a discussion. In the focus group, people are free to give their views and opinions to the questions that the moderator asks.

Two organizations – Africare and the University of Michigan—have joined together to learn more about our community; they want to better understand our experiences, beliefs, and traditions about seeking care. I am here to ask you questions about health issues, especially for pregnancy, delivery, and newborns. Before we begin, I thought we should introduce ourselves. Let me begin. My name is _____ and I work for Africare.
I want to remind you that your comments are the research team only to learn more about the community and nothing you say will not be shared with others.

START THE TAPE RECORDER HERE!

AFTER YOU TURN ON THE TAPE RECORDERS, BE SURE TO STATE: THE DATE, YOUR NAME, THE DISTRICT, THE COMMUNITY/HEALTH CENTER AND THE TYPE OF GROUP (e.g. WRA, Community members, or Health workers/SMAGs).

YOU ARE READY TO ASK THE QUESTIONS.

First, I'd like to learn a little about your customs, traditions and community.

Tell me about your community?

Probe:

- What do you like most about living in your community?
- What would you like to see change?
- Do you feel supported by your community?
- Can you count on people in your community if you need to borrow money?
- Can you count on your community to help if you need to go to the doctor or hospital?

1) What do you think are the major health problems in your community?
   Probe:
   - Do you know any women that have died while giving birth or in the few days after?
   - How many women have died while giving birth in your community?
     i. Tell me what people in the community did when the mother died.
     ii. Tell me what you saw.
     iii. Tell me what happened.
     iv. Tell me what helped.
     v. What caused the mother to die?

2) Tell me about the information SMAGs provide about pregnancy or childbirth.
   - What do you think about the information SMAGs provide about caring for newborns?

3) Tell me about the information TBAs provide about pregnancy or childbirth?

4) What do you think about the information TBAs provide about caring for newborns?

5) Tell me about the information your family or friends provided about pregnancy and childbirth?

6) Who do you go to for answers, guidance, and advice if you have a problem or question about pregnancy, childbirth or newborns?
   Probe:
   - How do they influence the decisions you make about your health and the health of your baby?
   - How do you (women in your community) get the resources you need to change things that involve your health?
   - What health information do you want (need)?

7) Have you heard about some women delivering at home?
   Probes:
   - Why would a woman choose to deliver at home?
   - Who decides where she will deliver?
   - What might make it easier for a woman to use a facility for birth?

8) In the past 6 months, have you participated in a meeting or gathering around pregnancy, childbirth, or newborn care?
   Probes:
   - Tell me more about that.
   - Have you ever been involved in organizing a meeting or gathering to provide information to your community?
   - What types of groups or meetings would you like to see in your community?

9) Tell me about other groups or important community members that influence decisions that involve the community.
   Probes:
   - How much influence do they have over the decisions that involve your life?
   - How much do you believe you can control the decisions that involve your life?
   - What changes are important in the community?

Appendix B

Baseline data with oblimin rotation

Factor	Items from CM survey tool	Factor loading (Pattern matrix)	Cronbach's alpha
Construct 1	I am often a leader in groups	0.785	0.738
	I find it very easy to talk in front of groups	0.747	
	I can usually organize people to get things done	0.628	
	I am satisfied with the amount of change I have over decisions that this group makes	0.229	
Construct 2	Using a condom every time with my partner would make my partner not trust me.	0.770	0.728
	Using a condom every time I have sex would make my partner think I don't trust them.	0.746	
	Using a condom every time I have sex would make my partner angry.	0.591	
Construct 3	This group has control over decisions that involve my life	0.749	0.755
	This group is successful in achieving its goals	0.658	
	I can influence the decisions that this group makes	0.650	
	My community has influence over the choices that involve my life	0.577	
Construct 4	I believe a community can hold group meetings to talk about issues that involve them	0.598	0.623

	I believe that a community can have a say in changing the conditions of their lives	0.597	
	I believe that a community can talk about the issues that involve them freely among themselves	0.483	
	I believe a community can work with current community groups to deal with issues that involve them	0.442	
	I think my community is a good place to live	0.385	
Construct 5	I feel good with the amount of control I have over decisions that involve my community	0.713	0.566
	I can control decisions that involve my community	0.501	
	I believe a community can get resources to change things that involve them	0.253	

Endline data with oblimin rotation

Factor	Items from CM survey tool	Factor loading (Pattern matrix)	Cronbach's alpha
Construct 1	I believe that a community can talk about the issues that involve them freely among themselves	0.779	0.680
	I believe a community can hold group meetings to talk about issues that involve them.	0.772	
	I believe a community can have a say in changing the conditions of their lives.	0.463	
	I believe a community can work with current community groups to deal with issues that involve them.	0.445	
	I feel good with the amount of control that I have over the decisions that involve my community.	0.326	
	I think my community is a good place to live	0.271	
Construct 2	Using a condom every time with my partner would make my partner not trust me.	0.713	0.697
	Using a condom every time I have sex would make my partner think I don't trust them.	0.710	
	Using a condom every time with my partner would make my partner angry.	0.547	
Construct 3	This group has control over decisions that involve my life.	0.686	0.511
	I can control decisions that involve my community.	0.421	
	My community has influence over the choices that involve my life.	0.421	

Construct 4	I find it very easy to talk in front of groups.	0.754	0.716
	I am often a leader in groups.	0.671	
	I can usually organize people to get things done.	0.618	
Construct 5	This group is successful in achieving its goals.	0.536	0.357
	I am satisfied with the amount of change I have over decisions this group makes.	0.414	
Construct 6	I believe a community can get resources to change things that involve them.	0.538	0.391
	I can influence the decisions that this group makes.	0.337	

Baseline data with varimax rotation

Factor	Items from CM survey tool	Factor loading (Rotated factor matrix)	Cronbach's alpha
Construct 1	This group has control over decisions that involve my life	0.736	0.755
	I can influence the decisions that this group makes	0.670	
	This group is successful in achieving its goals	0.657	
	My community has influence over the choices that involve my life	0.559	
Construct 2	I am often a leader in groups	0.757	0.738
	I find it very easy to talk in front of groups	0.732	
	I can usually organize people to get things done	0.649	
	I am satisfied with the amount of change I have over decisions that this group makes	0.283	
Construct 3	Using a condom every time with my partner would make my partner not trust me	0.773	0.728
	Using a condom every time I have sex would make my partner think I don't trust them	0.723	
	Using a condom every time I have sex would make my partner angry	0.584	
Construct 4	I believe a community can hold group meetings to talk about issues that involve them	0.582	0.607

	I believe that a community can have a say in changing the conditions of their lives	0.582	
	I believe that a community can talk about the issues that involve them freely among themselves	0.484	
	I believe a community can work with current community groups to deal with issues that involve them	0.482	
	I think my community is a good place to live	0.377	
	I believe a community can get resources to change things that involve them	0.269	
Construct 5	I feel good with the amount of control I have over decisions that involve my community	0.694	0.705
	I can control decisions that involve my community	0.517	

Endline data with varimax rotation

Factor	Items from CM survey tool	Factor loading (Rotated factor matrix)	Cronbach's alpha
Construct 1	I believe that a community can talk about the issues that involve them freely among themselves	0.731	0.680
	I believe a community can hold group meetings to talk about issues that involve them	0.716	
	I believe that a community can have a say in changing the conditions of their lives	0.510	
	I believe a community can work with current community groups to deal with issues that involve them	0.474	
	I feel good with the amount of control I have over decisions that involve my community	0.366	
	I think my community is a good place to live	0.310	
Construct 2	I find it very easy to talk in front of groups	0.725	0.716
	I am often a leader in groups	0.642	
	I can usually organize people to get things done	0.594	
Construct 3	Using a condom every time I have sex would make my partner think I don't trust them	0.724	0.697
	Using a condom every time with my partner would make my partner not trust me	0.711	
	Using a condom every time I have sex would make my partner angry	0.531	

Construct 4	This group has control over decisions that involve my life	0.655	0.511
	My community has influence over the choices that involve my life	0.438	
	I can control decisions that involve my community	0.433	
Construct 5	I believe a community can get resources to change things that involve them	0.512	0.391
	I can influence the decisions that this group makes	0.347	
Construct 6	This group is successful in achieving its goals	0.526	0.357
	I am satisfied with the amount of change I have over decisions that this group makes	0.421	

Baseline & endline data combined with oblimin rotation

Factor	Items from CM survey tool	Factor loading (Pattern matrix/ Structure matrix)	Cronbach's alpha
Construct 1	This group has control over decisions that involve my life.	0.734	0.671
	I can influence the decisions that this group makes.	0.525	
	My community has influence over the choices that involve my life.	0.522	
	This group is successful in achieving its goals.	0.504	
	I am satisfied with the amount of change I have over decisions this group makes	0.245	
Construct 2	Using a condom every time I have sex would make my partner think I don't trust them.	0.739	0.712
	Using a condom every time with my partner would make my partner not trust me.	0.736	
	Using a condom every time with my partner would make my partner angry.	0.554	
Construct 3	I believe a community can hold group meetings to talk about issues that involve them.	0.678	0.632
	I believe that a community can talk about the issues that involve them freely among themselves .	0.621	
	I believe a community can have a say in changing the conditions of their lives.	0.460	
	I think my community is a good place to live.	0.429	

Construct 4	I find it very easy to talk in front of groups.	0.765	0.763
	I am often a leader in groups.	0.727	
	I can usually organize people to get things done.	0.656	
Construct 5	I feel good with the amount of control that I have over the decisions that involve my community.	0.351	0.479
	I believe a community can work with current community groups to deal with issues that involve them.	0.327	
	I can control decisions that involve my community.	0.319	
	I believe a community can get resources to change things that involve them.	0.284	

Baseline & endline combined with varimax rotation

Factor	Items from CM survey tool	Factor loading (Rotated component matrix)	Cronbach's alpha
Construct 1	I find it very easy to talk in front of groups.	0.728	0.763
	I am often a leader in groups.	0.686	
	I can usually organize people to get things done.	0.649	
Construct 2	This group has control over decisions that involve my life.	0.698	0.687
	I can influence the decisions that this group makes	0.550	
	My community has influence over the choices that involve my life	0.512	
	This group is successful in achieving its goals	0.490	
	I can control decisions that involve my community	0.358	
	I am satisfied with the amount of change I have over decisions that this group makes	0.290	
Construct 3	I believe a community can hold group meetings to talk about issues that involve them.	0.667	0.659
	I believe that a community can talk about the issues that involve them freely among themselves .	0.635	
	I believe a community can have a say in changing the conditions of their lives.	0.493	
	I think my community is a good place to live.	0.401	
	I believe a community can work with current community groups to deal with issues that involve them.	0.398	

Construct 4	Using a condom every time I have sex would make my partner think I don't trust them.	0.731	0.712
	Using a condom every time with my partner would make my partner not trust me.	0.731	
	Using a condom every time with my partner would make my partner angry.	0.546	
Construct 5	I feel good with the amount of control that I have over the decisions that involve my community.	0.366	0.192
	I believe a community can get resources to change things that involve them.	0.274	

Baseline & endline combined with varimax rotation, forced 4 factor solution

Factor	**Items from CM survey tool**	**Factor loading (Rotated factor matrix)**	**Cronbach's alpha**
Construct 1	I think my community is a good place to live	0.364	0.641
	I believe that a community can talk about the issues that involve them freely among themselves	0.636	
	I believe a community can hold group meetings to talk about issues that involve them	0.653	
	I believe a community can work with current community groups to deal with issues that involve them	0.468	
	I believe that a community can have a say in changing the conditions of their lives	0.518	
	I believe a community can get resources to change things that involve them	0.308	
Construct 2	I can influence the decisions that this group makes	0.555	0.687
	This group has control over decisions that involve my life	0.665	
	This group is successful in achieving its goals	0.497	
	I am satisfied with the amount of change I have over decisions that this group makes	0.316	
	My community has influence over the choices that involve my life	0.524	
	I can control decisions that involve my community	0.391	
Construct 3	I am often a leader in groups.	0.694	0.726
	I find it very easy to talk in front of groups.	0.741	
	I can usually organize people to get things done.	0.619	

	I feel good with the amount of control that I have over the decisions that involve my community.	0.304	
Construct 4	Using a condom every time with my partner would make my partner angry.	0.545	0.712
	Using a condom every time I have sex would make my partner think I don't trust them.	0.729	
	Using a condom every time with my partner would make my partner not trust me.	0.730	

Baseline & endline combined with varimax rotation, forced 3 factor solution

Factor	**Items from CM survey tool**	**Factor loading (Rotated factor matrix)**	**Cronbach's alpha**
Construct 1	I am often a leader in groups	0.459	0.759
	I find it very easy to talk in front of groups	0.472	
	I can usually organize people to get things done	0.541	
	I can influence the decisions that this group makes	0.584	
	This group has control over decisions that involve my life	0.569	
	This group is successful in achieving its goals	0.449	
	I am satisfied with the amount of change I have over decisions that this group makes	0.362	
	My community has influence over the choices that involve my life	0.425	
	I can control decisions that involve my community	0.482	
	I feel good with the amount of control I have over decisions that involve my community	0.409	
Construct 2	I think my community is a good place to live	0.362	0.641
	I believe that a community can talk about the issues that involve them freely among themselves	0.636	
	I believe a community can hold group meetings to talk about issues that involve them	0.617	
	I believe a community can work with current community groups to deal with issues that involve them	0.472	

	I believe that a community can have a say in changing the conditions of their lives	0.501	
Construct 3	Using a condom every time with my partner would make my partner angry.	0.519	0.712
	Using a condom every time I have sex would make my partner think I don't trust them.	0.678	
	Using a condom every time with my partner would make my partner not trust me.	0.678	

Final Solution: Baseline & endline combined with varimax rotation, items removed

Factor	Items from CM survey tool	Factor loading (Rotated factor matrix)	Cronbach's alpha
Construct 1	I am often a leader in groups	0.712	**0.763**
	I find it very easy to talk in front of groups	0.729	
	I can usually organize people to get things done	0.631	
Construct 2	I believe that a community can talk about the issues that involve them freely among themselves	0.635	**0.658**
	I believe a community can hold group meetings to talk about issues that involve them	0.688	
	I believe a community can work with current community groups to deal with issues that involve them	0.428	
	I believe that a community can have a say in changing the conditions of their lives	0.511	
Construct 3	Using a condom every time with my partner would make my partner angry.	0.555	**0.712**
	Using a condom every time I have sex would make my partner think I don't trust them.	0.752	
	Using a condom every time with my partner would make my partner not trust me.	0.708	
Construct 4	I can influence the decisions that this group makes	0.575	**0.617**
	This group has control over decisions that involve my life	0.615	
	This group is successful in achieving its goals	0.538	